

**School of Occupational Therapy and Social Work
The Cooperative Research Centre for Living with Autism (Autism CRC)**

**The Integrated Employment Success Tool (IEST™): Development and
Trial of an Autism-Specific Workplace Tool to Assist Employers in
Modifying the Work Environment**

Melissa Tamara Scott

**This thesis is presented for the Degree of
Doctor of Philosophy
of
Curtin University**

November 2017

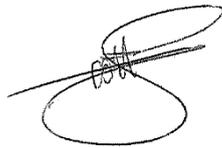
Declaration

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

The research presented and reported in this thesis was conducted in accordance with the National Health and Medical Research Council National Statement on Ethical Conduct in Human Research (2007) – updated March 2014. The proposed research study received human research ethics approval from the Curtin University Human Research Ethics Committee (EC00262), Approval Number #HR141/2014.

Signature:

A handwritten signature in black ink, consisting of a large, stylized 'S' shape with a horizontal line crossing through it.

Date: 20/11/2017

Acknowledgements

First and foremost, I would like to thank and acknowledge the support and assistance of my three supervisors, Professor Torbjörn Falkmer, Dr Marita Falkmer and Professor Sonya Girdler. It has been such a privilege to have three unique perspectives, all of which have shaped me into the young researcher I have become. To Torbjörn, thank you for your 'big picture' thinking, positivity and for always presenting me with new research opportunities. Not only do we share a mutual love for hard rock, but your guidance in methodologies, statistics and simplifying all complexities has certainly expanded my knowledge. To Marita, thank you for being consistent, supportive and often the voice of reason. Your passion to make this world more inclusive for all people, especially those on the autism spectrum, has continuously encouraged me to reframe my thinking and challenged me to become a better Occupational Therapist. To Sonya, thank you for always being so generous with your time. You continuously set high expectations, pushing me at times beyond my perceived limits, but always having the faith that I would deliver. Thank you for your guidance, encouragement and mentorship.

My deepest gratitude to Emeritus Professor Sylvia Rodger, without whom this thesis would never have been possible. It was an absolute honour to have known her and to have had her valuable insight, experience and support throughout my journey. She will be missed. I hope that her passion for creating a more inclusive community and improving the lives of those on the autism spectrum is translated throughout this thesis.

I am very grateful to the adults on the autism spectrum and all the employers who took part in this study. Without their commitment to improving and diversifying the workforce this research would have not been possible. Thank you for dedicating your valuable time and insight. Thank you to the ongoing support and input from the Autism Association of Western Australia, Autism Spectrum Australia (Aspect), Autism Queensland and EDGE Employment Solutions. I would like to offer a special thanks to employment coordinators from Aim Employment, Grace Downie and Aaron Basil for seeing the value in this study by promoting and encouraging it during the recruitment stages, you were my lifesavers. An extended thank you to the community reference group, whose input ensured this study was relevant to the needs of the autism community.

My sincere thanks and appreciation to the many people who have provided academic support, assistance and contributed to this study. I am thankful to: Dr Richard Parsons for his guidance in statistical methods; Dr Delia Hendrie for her advice and expertise in

economics; Associate Professor Tele Tan for seeing the value in employing people on the autism spectrum and promoting this study across his vast network of connections; Professor Sven Bölte for his wisdom and guidance in the application of the ICF in both a clinical and research context. I am forever grateful to you for sharing the ICF Core Sets for ASD with our research team, which certainly enhanced our understanding of autism. Joel Wilson for his friendship, but also his perspective as an individual on the autism spectrum; Dr Sharmila Vaz, a friendship I truly value that has always filled me with wisdom and a new perspective; Dr Ben Milbourn for the many hours spent coding (a tedious task with copious amounts of coffee), but also for your friendship and encouragement; and lastly, Marg Pickup, Shenara Fernando, Mary-Ann Spearing, Ciara Mitchell and the research associates from Curtin University, Gal Rose, Nathan Chapman, Tim Parkin and Greg Lynn with the support of Associate Professor Marina Ciccarelli, for their assistance with recruitment and data analysis. You made a very difficult task that much easier.

I am grateful to the Australian Postgraduate Award and the Curtin University Postgraduate Student Association for providing me with various scholarships that have funded the duration of my studies and conference attendance. Thank you to the Autism CRC for providing me with an additional scholarship and many opportunities to present my research and travel nationally. Special thank you to Cheryl Mangan for her support and for organising all the scholar research activities and learning experiences throughout my journey. I feel blessed to be part of the Autism CRC and associated with the amazing work that is being produced.

I am forever indebted to Megan Hatfield, my research buddy and friend. I feel so blessed to have had you along this challenging, rollercoaster of a PhD. We have shared both tears and laughter over the years. I cannot imagine what this time would have been like without you. To the rest of my PhD cohort: Alison Blane, Melissa Black, Julia Tang, Belinda Cuomo, Derserri Chee, Craig Thompson and Robyn Earl- without you the last four years would have been very lonely. Thank you for all the laughter, travel adventures, time spent listening and advising. I cannot wait to graduate alongside you as both friends and doctors.

To my family and friends, Mom, Dad, Tarryn, Sophie and Chantal, you have provided endless emotional support and encouragement. Your belief in my ability to accomplish this dream has been the faith I needed to see it through. I love and appreciate you all dearly. Finally, to my husband Paul, there are no words to express my thanks to you for your love, prayers, patience, inspiration, laughter and positive thinking.

Dedication

While completing a PhD is often considered a task that is undertaken as an individual, I whole heartedly believe I could never have accomplished this dream without my husband. Paul, you are my best friend and love of my life and have been my rock throughout this time. Your constant encouragement, energy and prayers is what carried me through whenever I doubted myself or felt like giving up. Thank you for never allowing me to give up. I appreciate you and your positive outlook on life and I am forever grateful for your support, and so I dedicate this to you.

Abstract

Employment is a highly desirable social achievement for most individuals, including those on the autism spectrum, as it is considered a key component in the successful transition into adulthood. Despite individuals on the autism spectrum having much to contribute to society, their employment outcomes remain poor. In Australia, the labour force participation rate for individuals on the autism spectrum is 42%, compared to 53% of all individuals with disabilities, and 83% for individuals without disabilities. The core characteristics associated with autism often result in individuals on the autism spectrum experiencing challenges securing and maintaining employment. While adult-based employment interventions are emerging, to date most of those have targeted intrinsic, personal factors of individuals on the autism spectrum, such as deficits in social interaction, behavioural traits and executive functioning. Very little attention has been given to the impact of social and environmental factors extrinsic to individuals in major life areas, such as employment, and the significant role they play in facilitating or hindering work participation.

The overall aim of this thesis was to design, develop and evaluate an autism-specific workplace tool for employers to modify the work environment to meet the specific needs of their employees on the autism spectrum. The Medical Research Council framework guided the four phases of this study. In *Phase I* a multifaceted needs assessment was conducted. Initially, a scoping literature review was conducted to examine the current employment of individuals on the autism spectrum, followed by two studies exploring the employment needs and concerns of employers. Next, the conceptual framework underpinning the development of the autism-specific workplace tool, the Integrated Employment Success Tool (IEST™) was identified (Chapters 2-5). *Phase II* focused on the development and piloting of the IEST™ through testing the feasibility of the intervention (Chapter 6). *Phase III* conducted a randomised controlled trial to determine the effectiveness of the IEST™ in improving employers' self-efficacy and knowledge in modifying the work environment to meet the specific needs of their employees on the autism spectrum. The trial comprised of 84 employers, comparing those using the IEST™ with employers receiving employment support services as usual. Following the completion of the trial a process evaluation was conducted to provide an in-depth understanding as to whether the IEST™ was effective (Chapter 7-8). *Phase IV* addressed the implications and

translation of the findings. A combination of quantitative and qualitative data analysis techniques was utilised across phases to reveal the effectiveness of the IEST™.

The results of this study demonstrated that the IEST™ intervention was effective in improving employers' self-efficacy and knowledge in modifying the work environment for their employees on the autism spectrum in comparison to usual workplace supports. This study revealed that the more employers knew and understood about autism, the more confident they were in approaching their employees to understand their unique workplace needs. This study also revealed that employer characteristics, such as previous experience working with an employee with a disability and being associated with a larger company were more likely to influence favourable employer attitudes towards hiring decisions and willingness to implement workplace accommodations. Lastly, the IEST™ was designed to be cost-effective and easily implemented, with many workplace modifications likely to be beneficial to both employees with and without autism. This finding, along with favourable employer attitudes, have been recognised as key factors in mitigating employers' perceived concerns in relation to the costs outweighing the benefits of hiring individuals on the autism spectrum.

This thesis highlighted the crucial role that employers play in facilitating or hindering the work participation of individuals on the autism spectrum. It presents the world's first autism-specific evidence-based tool aimed at supporting employers in modifying their work environments. This thesis also presents a strong cost-benefit argument, advocating for the employment of individuals on the autism spectrum as a 'good business decision'. These findings are timely given the paucity of evidence examining evidence-based employment interventions and the unprecedented number of adolescents transitioning from high school into adulthood and seeking employment. The employment of individuals on the autism spectrum is an issue that *cannot* be ignored. New knowledge gained from this study can further guide both current and prospective employers in improving their skills, knowledge and confidence in hiring and supporting individuals on the autism spectrum in their workplaces.

Table of Contents

DECLARATION	I
ACKNOWLEDGEMENTS	II
DEDICATION	IV
ABSTRACT	V
LIST OF FIGURES	IX
LIST OF TABLES	X
LIST OF APPENDICES	XI
LIST OF ABBREVIATIONS	XII
LIST OF PUBLICATIONS	XIII
LIST OF CONFERENCE PRESENTATIONS	XIV
STATEMENT OF AUTHOR CONTRIBUTION	XVI
CHAPTER 1: INTRODUCTION	1
BACKGROUND	2
STATEMENT OF THE PROBLEM	4
SIGNIFICANCE OF THE STUDY	7
OVERVIEW OF THE STUDY	9
PHASES AND OBJECTIVES OF THE STUDY	10
STUDY SETTING	13
OVERVIEW OF THESIS STRUCTURE	14
REFERENCES	19
CHAPTER 2: PAPER I-SCOPING LITERATURE REVIEW USING THE ICF FRAMEWORK	24
PREFACE	25
CHAPTER 3: PAPER II- VIEWPOINT STUDY ON SUCCESS FACTORS FOR EMPLOYMENT	97
PREFACE	98
CHAPTER 4: PAPER III- COST-BENEFIT STUDY: AN EMPLOYER PERSPECTIVE	114
PREFACE	115
CHAPTER 5: PAPER IV-CONCEPTUAL FRAMEWORK OF THE IEST™	132
PREFACE	133
INTRODUCTION	134
APPLICATION OF SELF-EFFICACY THEORY	137
VICARIOUS EXPERIENCE	138
APPLICATION OF THE ICF FRAMEWORK	139
APPLICATION OF THE STRENGTHS-BASED APPROACH	143
DISCUSSION.....	144
CONCLUSION	146
REFERENCES	147
CHAPTER 6: PAPER V-PROTOCOL AND PILOT STUDY: DEVELOPMENT OF THE IEST™	153
PREFACE	154

CHAPTER 7: PAPER VI-EFFECTIVENESS STUDY: RCT OF THE IEST™	193
PREFACE	194
CHAPTER 8: PAPER VII-PROCESS EVALUATION OF THE IEST™	235
PREFACE	236
CHAPTER 9: GENERAL DISCUSSION	268
PREFACE	269
OVERVIEW	270
KEY FINDINGS AND IMPLICATIONS	270
LIMITATIONS.....	277
RECOMMENDATIONS.....	281
KNOWLEDGE TRANSLATION.....	286
SUMMARY.....	287
REFERENCES	288
THESIS REFERENCE LIST	294
APPENDICES	313

List of Figures

Figure 1.1 Interactions between the components of the ICF	7
Figure 1.2 Key elements of the development and evaluation process	10
Figure 1.3 Autism CRC projects running concurrently Australia-wide	14
Figure 1.4 Overview of thesis structure and relationship between papers	15
Figure 5.1 Possible interaction between the ICF components in relation to individuals on the autism spectrum and employment outcomes.....	140
Figure 5.2 Integration of the theory, framework and approach in the development and evaluation of an employer-based intervention	145

List of Tables

Table 1.1 Summary of research methods used in each paper	18
Table 5.1. Selected studies drawing from the theoretical constructs of self-efficacy, the ICF framework and the strengths-based approach	136
Table 5.2 ICF environmental factors influencing employment outcomes for individuals on the autism spectrum.....	143

List of Appendices

Appendix A Curtin University Human Research Ethics Committee Approval letter.....	314
Appendix B Employment program and intervention studies linked to the component of the ICF according to target, modality and outcome of interventions.....	317
Appendix C Published manuscript: The costs and benefits of employing an adult with Autism Spectrum Disorder: A systematic review-Paper VIII.....	323
Appendix D The benefits and costs to employers of employing an adult with on the autism spectrum survey.....	339
Appendix E SPIRT guidelines.....	356
Appendix F Information sheet informing the Employer Survey.....	363
Appendix G: CONSORT 2010 checklist of information to include when reporting a randomised trial	367
Appendix H Employer Survey Baseline Measures	371
Appendix I Interview guide: Process Evaluation of the IEST™.....	396

List of Abbreviations

ACTRN	Australian Clinical Trial Registration Number
ADHD	Attention Deficit Hyperactivity Disorder
AS	Asperger Syndrome
ASD	Autism Spectrum Disorder
Autism CRC	Cooperative Research Centre for Living with Autism
CONSORT	Consolidated Standards of Reporting Trials
CRPD	Convention on the Rights of People with Disabilities
DES	Disability Employment Service providers
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders 4 th Edition
DSM-5	Diagnostic and Statistical Manual of Mental Disorders 5 th Edition
DV	Dependent Variable
ESES	Employer Self-Efficacy Scale
HFA	High Functioning Autism
HR	High Responders
ICF	International Classification of Functioning, Disability and Health
IEST™	Integrated Employment Success Tool
IV	Independent Variable
LOCF	Last Observation Carried Forward
LR	Low Responders
MPOC	Measure of Process of Care
MRC	Medical Research Council framework
NDIS	National Disability Insurance Scheme
OECD	Organisation for Economic Co-operation and Development
PDD-NOS	Pervasive Developmental Disorder-Not Otherwise Specified
RCT	Randomised Controlled Trial
SAS	Statistical Analysis System software version 9.2
SATWD	Scale of Attitudes Toward Workers with Disabilities
SPSS	Statistical Package for the Social Sciences
WHO	World Health Organization

List of Publications

List of published manuscripts

Scott M, Falkmer, M., Girdler, S., & Falkmer, T. Viewpoints on Factors for Successful Employment for Adults with Autism Spectrum Disorder. PLOS One. 2015;10(10): e0139281. **Impact factor 2.806; 20 citations**

Scott M, Jacob, A., Hendrie, D., Parsons, R., Girdler, S., Falkmer, T., & Falkmer, M. Employers' perception of the costs and the benefits of hiring individuals with autism spectrum disorder in open employment in Australia. PLOS One. 2017;12(5):1-16. **Impact factor 2.806; 7 citations**

Scott. M, Falkmer, M., Falkmer, T., Girdler, S. Evaluating the effectiveness of an autism-specific workplace tool for employers: A randomised controlled trial. Journal for Autism and Developmental Disorders. 2018: doi:10.1007/s10803-018-3611-0 **Impact factor 3.341**

Scott M, Milbourn, B., Falkmer, M., Black, M., Bölte, S., Halladay, A., Lerner. M., Taylor, J.L, & Girdler, S. Factors impacting employment for people with Autism Spectrum Disorders: A scoping review. Autism. 2018; doi: 10.1177/1362361318787789 **Impact factor 3.684**

Jacob A, **Scott, M.**, Falkmer, M., & Falkmer, T. The Costs and Benefits of Employing an Adult with Autism Spectrum Disorder: A Systematic Review. PLOS One. 2015;10(10): e0139896. **Impact factor 2.806; 16 citations**

List of manuscripts under review

Scott M, Girdler, S., Falkmer, T., & Falkmer, M. Development and evaluation of an autism-specific workplace tool for employers: A trial protocol. Evaluation and Planning. 2018. **Impact factor 1.210**

Scott M, Falkmer, M., Kuzminski, R., Falkmer, T., & Girdler, S. Process evaluation of a randomised controlled trial evaluating an autism-specific workplace tool for employers. Journal for Autism and Developmental Disorders. 2018. **Impact factor 3.684**

List of Conference Presentations

- Scott M, Falkmer, M., Girdler, S., & Falkmer, T. Finding a job, keeping a job: Understanding key factors for employment for adults with ASD. Australasian Society for Autism Research Conference (ASfAR); December 3-5; Melbourne, Australia 2014.
- Scott M, Falkmer, M., Girdler, S., & Falkmer, T. "I commit to work, and work commits to me": Viewpoints on successful employment for people on the Autism Spectrum. Regional International Society for Autism Research Conference (INSAR); November 6-8; Shanghai, China 2015.
- Scott M. Finding a job, keeping a job. Three-minute thesis competition final; August 16; Curtin University, Perth, Australia 2015.
- Scott M, Falkmer, M., Girdler, S., & Falkmer, T. Understanding key factors for successful employment for adults with Autism Spectrum Disorder. Asia Pacific Autism Conference (APAC); September 9-11; Brisbane, Australia 2015.
- Scott M J, A., Hendrie, D., Parsons, R., Girdler, S., Falkmer, T., & Falkmer, M. The costs and benefits of employing adults on the Autism Spectrum from the perspective of the employer. Autism Europe International Congress; September 16-18; Edinburgh, Scotland 2016.
- Scott M, Girdler, S., Falkmer, T., & Falkmer, M. Developing an autism-specific workplace tool for employers. Australasian Society for Autism Research Conference (ASfAR); December 8-9; Perth, Australia 2016.
- Scott M, Jacob, A., Hendrie, D., Parsons, R., Girdler, S., Falkmer, T., & Falkmer, M. Benefits and costs of employing an adult on the Autism Spectrum. Australasian Society for Autism Research Conference (ASfAR); December 8-9; Perth, Australia 2016
- Scott M, Jacob, A., Hendrie, D., Parsons, R., Girdler, S., Falkmer, T., & Falkmer, M. The costs and benefits of employing an adult on the Autism Spectrum. International Meeting for Autism Research Conference (IMFAR); May 10-13; San Francisco, United States of America 2017
- Scott M, Girdler, S., Falkmer, T., & Falkmer, M. Developing an autism-specific workplace tool for employers. International Meeting for Autism Research Conference (IMFAR); May 10-13; San Francisco, United States of America 2017.
- Scott M. Understanding Successful Employment for Adults on the Autism Spectrum: Development of the Integrated Employment Success Tool. Cooperative Research Centre Association Conference showing casing early career researchers final; May 23-25; Canberra, Australia 2017

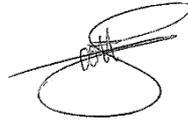
Scott M., Falkmer, M., Falkmer, T & Girdler, S. Evaluating the Effectiveness of an Autism-Specific Workplace Tool. International Meeting for Autism Research Conference (INSAR); May 9-12; Rotterdam, Netherlands 2018.

Scott M, Milbourn, B., Falkmer, M., Black, M., Bölte, S., Halladay, A., Lerner, M., Taylor, J.L, & Girdler, S. Factors Impacting Employment for People with Autism Spectrum Disorder: A Scoping Review. International Meeting for Autism Research Conference (INSAR); May 9-12; Rotterdam, Netherlands 2018.

Scott, M. The Integrated Employment Success Tool (IEST™): Development and Trial of an Autism-Specific Workplace Tool to Assist Employers in Modifying the Work Environment. International Meeting for Autism Research Conference (INSAR); May 9-12; Rotterdam, Netherlands 2018.

Statement of Author Contribution

The nature and extent of the intellectual input by the candidate and co-authors has been validated by all authors:



Melissa Scott
(Candidate)



Professor Torbjörn Falkmer
(Primary supervisor)



Dr Marita Falkmer
(Secondary supervisor)



Professor Sonya Girdler
(Secondary supervisor)

I warrant that I have obtained, where necessary, permission from the copyright owners to use any third-party copyright material reproduced in the thesis (e.g., questionnaires), or to use any of my own published work (e.g., journal articles) in which the copyright is held by another party (e.g., publisher).

Please see appendices for written statement from each of the co-authors pertaining to intellectual input.

Chapter 1: Introduction

Background

This thesis examines the environmental factors, namely employers, influencing the employment of individuals on the autism spectrum, in an Australian context. Australia is divided into six states including New South Wales, Queensland, South Australia, Tasmania, Victoria and Western Australia, and two territories including Australian Capital Territory, where the nation's capital Canberra is located and the Northern Territory. Australia has a population of approximately 24 million people, with an estimated 164,000 individuals diagnosed with Autism Spectrum Disorder (ASD), representing approximately 1 in 150 Australians (1), consistent with estimates occurring internationally (2, 3).

This thesis examines open or competitive employment of individuals on the autism spectrum. Open or competitive employment refers to having a job and working in the general labour market, with wages earned represented in Australian dollars. Within open or competitive employment, the organisational structure and employment type is described within the context of Australia. Business or organisational structures are categorised as small (1-19 employees); medium (20-199 employees) or large (200+ employees) (4). Employment type may be classified as full-time (averaging 38 hours per week); part-time (less than 38 hours per week and entitled to the same benefits as a full-time employee, but on a pro rate basis); and, casual (irregular hours with no guarantee of work or any entitlements, such as sick or annual leave) (5). While this thesis seeks to address the employment process of finding, securing and maintaining a job for individuals on the autism spectrum, it does not address unemployment in general, or as a phenomenon. Given that employment of individuals with a disability is governed at a state or territory level, this thesis does not take a stance, nor provide recommendations regarding the policies, procedures, systems and services in relation to disability and employment. Instead, it describes the development and evaluation of an autism-specific intervention for employers facilitating the employment of individuals on the autism spectrum.

The current edition of the Diagnostic and Statistical Manual of Mental Disorders fifth edition (DSM-5) lists and describes the characteristics of ASD, a single diagnosis replacing three previous diagnoses known as: autistic disorder (generally referred to as autism), Asperger's disorder (or syndrome); and pervasive developmental disorder-not otherwise specified (PDD-NOS) (6, 7). The term 'ASD' is generally used by health professionals and

researchers. However, within the autism community it is recognised that there is no one perfect term or phrase and people have differing language preferences, from being described as an “autistic” to being “on the autism spectrum” to ‘living with autism” (8). For the purpose of this thesis, the term “on the autism spectrum” is used when referring to ASD. It is important to note that due to this thesis being comprised of seven papers submitted to different journals with varying preferences regarding ASD terminology, chapters vary according to the terminology used. While it is important to acknowledge what constitutes an ASD diagnosis, this thesis does not address the recent increase in autism or aspects relating to the diagnostic criteria or procedures. Consequently, all inclusion criteria regarding diagnosis of ASD were considered valid as self-report.

The International Classification of Functioning, Disability and Health (ICF) is used as a framework throughout the thesis to enable a broader and structured approach in understanding the influence of *environmental factors* exclusively in contributing to the employment of individuals on the autism spectrum (9). While the ICF comprises of an *activities and participation* component describing the range of domains regarding aspects of functioning from the perspective of the individual, i.e., the definition and perspective of what constitutes work participation of an individual on the autism spectrum in the workplace, this is not addressed in thesis (10).

The autism-specific workplace intervention developed and evaluated in this thesis considers the process of employment according to five stages including recruitment, the interview, job commencement and placement, workplace modifications and ongoing support. It does not consider the process of preparing for a job in terms of career planning, job matching, and the transition from high school to adulthood and employment. Nor does this thesis examine the perspective of the employee on the autism spectrum during the process of finding, securing and maintaining a job (with the exception of paper II). While the employee perspective would have provided further insight into employment outcomes in relation to job satisfaction, work performance and success, and social inclusion, it is outside the scope of this thesis. Finally, the use of both Australian and America spelling occurs throughout this thesis as it is based on seven standalone papers submitted to different journals with varying editing styles. Several repetitive elements exist that are unavoidable, but acknowledged.

Statement of the problem

The neurodevelopmental condition ASD is characterised by difficulties in social reciprocity, communication and unusual or repetitive behaviours (6, 11). Previously considered rare, there has been a dramatic increase in the number of individuals diagnosed, with an estimated prevalence of 1-2% (2, 3, 12). Possible explanations include a change in diagnostic criteria resulting in a more accurate and earlier diagnosis, increased awareness and the recognition that autism is a lifelong condition (11, 13). Previous research has concentrated on diagnosis, early intervention and school-based outcomes for children on the autism spectrum, but has lacked a focus on longitudinal outcomes into adolescence and adulthood (14-17). In the United States as many as 50, 000 adolescents on the autism spectrum are turning 18 every year and transitioning into adulthood (18). The transition into adulthood can be a difficult time for young people on the autism spectrum, with research highlighting the challenges and uncertainties faced in major life areas, including post-secondary education, establishing independence and interpersonal relationships and in particular, gaining employment (19, 20). Post-school employment opportunities for adults on the autism spectrum have traditionally been limited (21, 22). This is particularly problematic given that in Australia with a population of 24 million, there are approximately 75, 200 adults on the autism spectrum within the working age population of 15-64 years old (1).

Employment is a highly desirable social achievement for all individuals, including those on the autism spectrum, as it is considered a key component in the successful transition into adulthood (23-25). Work offers benefits beyond those of financial gain, including positive health outcomes, identity development and improved quality of life (24, 26, 27). Despite individuals on the autism spectrum having much to contribute to society, their employment outcomes are particularly poor, even when compared to other disability groups (28). Due to their social, communicative and cognitive difficulties, people on the autism spectrum may experience unique challenges finding and maintaining competitive employment. This may include difficulties promoting themselves in an interview, holding reciprocal conversations, integrating into a social network, adjusting to new work environments and responding flexibly to changes in tasks requirements (23, 29, 30). In contrast, individuals on the autism spectrum have many unique strengths and may perform well in jobs that require systematic information processing, a high degree of visual accuracy, precise technical abilities and increased concentration for long periods of time (30-32). While many of these attributes

are attractive qualities to employers, the social communication difficulties experienced by individuals on the autism spectrum, rather than their actual job performance, are the origin of workplace challenges, resulting in unemployment (23, 33). The consequences of unemployment remain an important issue given the continued poor employment outcomes of individuals on the autism spectrum (34). However, unemployment is multifaceted social problem and cannot exclusively be attributed to the characteristics of autism (27). Although certain aspects of social problems can be resolved through modifying individual behaviour, the role of environmental factors influencing work participation needs to be considered (35).

Research into adult outcomes in autism has predominantly focused on impairment and improving social functioning (36). While this is beneficial in improving outcomes, there has been a lack of consideration into the impact of environmental factors extrinsic to individuals on the autism spectrum (37). Environmental factors are an essential component in understanding individual functioning and the possible factors facilitating or hindering work participation for individuals on the autism spectrum (9). In the context of employment, environmental factors may include employer characteristics and management practices, the physical work environment, workplace culture and climate, disability employment support services and policies, systems and procedures (38-40). Employers can be considered an influential environmental factor in the employment process, with their attitudes towards disability in the workplace well-recognised as influencing their hiring decisions, inclusive workplace practices and willingness to provide workplace accommodations (41, 42). Employer attitudes may be influenced by societal stereotypes negatively promoting individuals with a disability as lacking the capacity and skills to adequately participate in the workforce in comparison to individuals without disability (43-45). Alternatively, the widely recognised benefits of organisational diversity in the workplace may shape employers' attitudes toward inclusion, equality and flexible management practices (40, 42, 46). Given the potential capacity of employers in either facilitating or hindering the work participation of individuals on the autism spectrum, there is a paucity of research examining the relative effectiveness of employers' knowledge, skills and abilities in hiring and supporting individuals on the autism spectrum. The International Classification of Functioning, Disability and Health is a structured and useful framework in guiding the examination of environmental factors impacting successful employment for individuals on the autism spectrum.

The International Classification of Functioning, Disability and Health

The International Classification of Functioning, Disability and Health (ICF) is a conceptual framework developed by World Health Organisation (WHO) to understand functioning and disability, by providing a scientific basis and standardised language for coding and classifying health and health-related states (9). The ICF is based on the biopsychosocial perspective, integrating the medical and social model to better conceptualise disability and functioning (9, 47). The ICF framework encompasses three components. First, *body functions and structures*, which describe the physiological functioning and anatomical parts of an individual, of which problems experienced are considered a significant deviation or loss and referred to as an 'impairment'. Next, *activities and participation* describe the execution of a task and involvement in a life event respectively, with difficulties experienced executing an activity described as 'limitations' and problems experienced in life situations as 'restrictions'. Lastly, *contextual factors* include both environmental factors and personal factors. *Environmental factors* include the physical, social and attitudinal environment and are described as 'facilitators' or 'barriers' to functioning and disability, while *personal factors* are described as intrinsic features of the individual that are not part of health condition. Personal factors are not classified within the ICF due to their variance, but are included to demonstrate their involvement (9). Interactions between the components of the ICF are dynamic and bidirectional, as shown in Figure 1.1. When changes occur in one component, they have the potential to modify one or more other components (9). The use of the ICF provides a relevant framework to explore and understand the complexity of employing individuals on the autism spectrum.

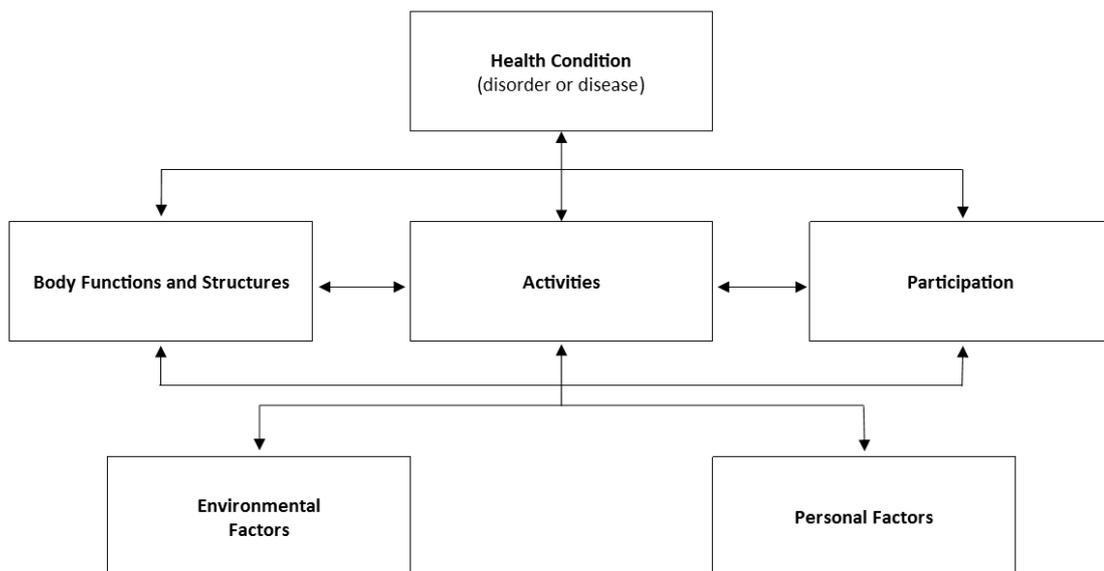


FIGURE 1.1 INTERACTIONS BETWEEN THE COMPONENTS OF THE ICF (9)

Significance of the study

Limited high-quality intervention studies

Systematic reviews examining autism-related adult interventions have highlighted methodological limitations of studies including: small sample sizes, low-level quality, descriptive and non-standardised outcome measures without a specific focus on autism in adulthood and major life areas such as, employment numbers and the development of interventions lacking a clear evidence-based framework (48-50). Of the intervention studies available, many report on general social outcomes, including employment, social relationships and independent living (37, 51, 52), with few reporting employment as a primary outcome (36). While it is possible that social outcomes may influence or depend on each other either facilitating or hindering success (37), it is essential that employment is examined as a primary outcome investigating the factors impacting on successful work participation for adults on the autism spectrum. Despite personal factors, such as gender, older age, education level and IQ being identified as positive predictors for employment outcomes (29, 36, 53, 54), individual differences and the heterogeneity across the autism spectrum make determining the generalisability of these factors on successful employment difficult (23). Due to these inconsistencies, few interventions exist with the aim of increasing work participation for individuals on the autism spectrum.

Impairment-focused interventions

Despite the lack of autism-specific employment interventions (55), a variety of programs and some interventions have been developed in response to the challenges experienced by adults on the autism spectrum in finding and securing meaningful employment. Many of the employment programs and interventions attempting to address the unique needs of adults on the autism spectrum, have focused on behavioural management practices, social and vocational skills training and supported employment strategies, including job matching, on-the-job training, and ongoing support (29, 55-57). While many of these employment programs and interventions may be considered beneficial, there is a lack of high quality studies evaluating their efficacy in terms of job retention, wages earned, hours worked, job satisfaction and improved quality of life (32, 58). In addition, the majority of employment programs and interventions remain impairment-focused, with little attention given to the impact of social and environmental factors extrinsic to adults on the autism spectrum. In order to effectively develop and evaluate employment interventions, there is a need to understand the integral role that environment factors play in influencing employment opportunities for adults on the autism spectrum.

Generic disability employment support services

The demand for specialist support services for adults on the autism spectrum seeking employment has dramatically increased in recent years (59). In Australia, disability employment service (DES) providers assist individuals on the autism with the job search and application process, job placement, workplace accommodations and ongoing support. They also provide support to employers in relation to financial subsidies and disability awareness training. However, the support services provided by DES providers are often generic to disability, treating the unique needs of job seekers on the autism spectrum as similar to other disability groups (58, 60). This may be attributed to the limited available and standardised employment interventions and guidelines for adults on the autism spectrum, a lack of knowledge and awareness of autism and the associated specific support needs (61). The ineffectiveness of current approaches is in part evident in finding that the cost of employment services is higher for autism in comparison to any other disability (62). This is likely the outcome of a model of service that doesn't meet the needs of this group. Clearly, the employment support needs of both employees on the autism spectrum and their employers are overlooked and under supported, particularly in relation to the social support needs in the workplace (60).

Overview of the study

Given these current limitations, this study is significant as it is the first to examine the environmental factors impacting on employment of individuals on the autism spectrum, demonstrating the effectiveness of an autism-specific workplace tool in improving employers' self-efficacy and knowledge in modifying the work environment to meet the specific needs of their employees on the autism spectrum. This study is timely, given the lack of autism-specific employment service providers and the roll out initiation of the National Disability Insurance Scheme (NDIS) Australia-wide, providing support for people with a disability to build their skills and enhance their capacity to participate in employment and the community (63).

Aim of the study

The overarching aim of this study was to design, develop and evaluate an autism-specific workplace tool for employers to modify the work environment to meet the specific needs of their employees on the autism spectrum. Such an intervention is considered complex, comprising of several interacting components which influence its development, evaluation and replication (64), particularly in relation to difficulties standardising the design, delivery of the intervention, the sensitivity of social and environmental contexts, the number of organisational levels targeted and the variability of outcomes (65, 66). The interaction of these components make it difficult to determine what exactly is the 'active ingredient' in determining the effectiveness of an intervention (67). In addressing these challenges in Australia, the Medical Research Council (MRC) proposed a systematic framework designed to guide the development and evaluation of complex interventions, drawing from the best available evidence and appropriate theory (65). The original guidelines of the MRC framework have recently been updated and refined, applying a more flexible and less linear approach to the evaluation process (68), focusing more on development and piloting of phases of intervention development (69). Given the multifaceted and dynamic nature of any work environment, and the context of organisational structures, climate and culture (70), developing an intervention targeting employers under real-work conditions is both challenging and complex. In addressing these complexities, the MRC framework was selected as the most appropriate to underpin the development and evaluation of the autism-specific workplace intervention for employers. The MRC framework guides an iterative process, consisting of four phases: development, feasibility and piloting, evaluation and implementation (Figure 1.2) (65).

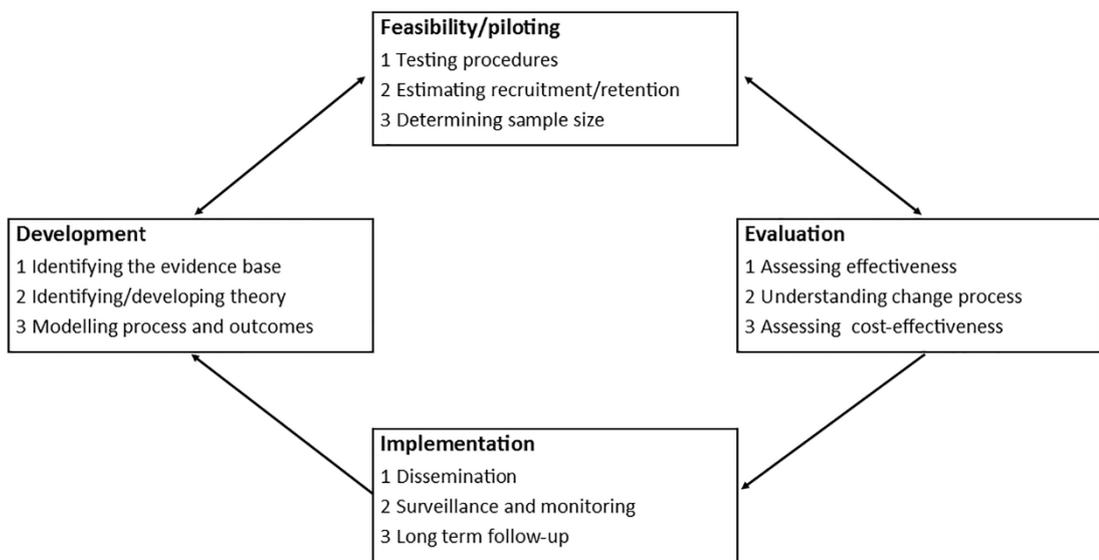


Figure 1.2 Key elements of the development and evaluation process (71)

Phases and objectives of the study

Phase I-Development

Developing an intervention should begin by identifying the relevant, existing evidence base and conducting a review of the literature (65). It is also necessary to develop a theoretical understanding of the process of which change is likely to occur by drawing on existing evidence and theory, or using new primary research to supplement this (66). Finally, the modelling process refers to defining and combining the components considered the most relevant for inclusion in the intervention through conducting a series of small studies (66).

Research objectives addressed in Phase I included:

Objective 1: To conduct a scoping literature review examining employment of individuals on the autism spectrum. The specific aims of this review were to:

1. employ the ICF as a framework to holistically and comprehensively review the employment literature;
2. explore measures used in evaluating employment outcomes;
3. identify the skills and abilities of individuals on the autism spectrum that contribute to successful employment;

4. describe, classify and link to the ICF Core Sets for ASD to current employment programs and interventions in autism; and,
5. summarise the overall outcomes of interventions and support programs.

Objective 2: To explore the key factors for successful employment for individuals on the autism spectrum. The specific aims of this study were to:

1. explore the key factors for successful employment from both the viewpoints of adults on the autism spectrum and employers; and,
2. contrast the similarities and differences of the viewpoints of adults on the autism spectrum and employers, and how their views impact the employment process.

Objective 3: To explore the benefits and costs of employing individuals on the autism spectrum from the perspective of the employer. The specific aims of the study were to:

1. compare a matched sample of employees *with* and *without* autism across the following work variables of interest: workplace performance, supervision and training and accommodations; and,
2. explore employer experiences employing individuals on the autism spectrum.

Objective 4: To determine the conceptual framework underpinning the development and evaluation of an autism-specific workplace tool.

Phase II-Feasibility and piloting

Phase II utilised the relevant evidence gathered to develop the optimum intervention (72). Prior to implementing an intervention, testing procedures assessing the feasibility of delivering the intervention and acceptability to users is required, by estimating the likely rates of recruitment and retention of participants and calculating sample sizes (65). Pilot studies are useful in addressing and modifying the main uncertainties identified in the development phase.

Research objectives addressed in Phase II included:

Objective 5: To design and develop an autism-specific workplace tool for employers.

Objective 6: To conduct a pilot study in determining the feasibility and accessibility of the autism-specific workplace tool, providing process and formative feedback.

Phase III-Evaluation

Designing and conducting an evaluation trial requires careful consideration of the chosen methodology and its limitations. The use of a randomised controlled trial (RCT) is preferable in assessing the effectiveness of an intervention, using the process of randomisation to prevent selection bias (66). Phase III also requires selection of appropriate and relevant primary and secondary measures and the analyses processes for managing multiple and variation in outcomes, accounting for possible subgroup analyses (65). A process evaluation is recommended following a RCT to provide insight into why the intervention was a success or failure, providing recommendations for optimising the intervention implementation (71).

Research objectives addressed in Phase III included:

Objective 7: To evaluate the effectiveness of an autism-specific tool for employers. The specific aims of this study were to:

1. evaluate the effectiveness of the autism-specific workplace tool in improving employers' self-efficacy and knowledge in modifying the work environment to meet the specific needs of their employees on the autism spectrum; and,
2. determine if employers using the autism-specific workplace tool would demonstrate more favourable attitudes towards disability in the workplace.

Objective 8: To determine of the effectiveness of implementation, usability and related barriers and facilitators of the autism-specific workplace tool. The specific aims of this study were to:

1. describe employers' experiences using the autism-specific workplace tool in their respective workplaces;
2. describe employers' perceptions of the usability of the autism-specific workplace tool;

3. explore the features of the autism-specific workplace tool contributing to change in the workplace, including recommendations for improvements; and,
4. identify the perceived barriers and enablers in using the autism-specific workplace tool.

Phase IV-Implementation

Translating evidence into practice and policy is an active process that can be achieved through ensuring the evidence is available and accessible using a multifaceted dissemination approach (65). Alongside research dissemination is the process of surveillance, monitoring and long-term follow-up of outcomes to assess the reliability and replicability of the intervention and results (73). While the translation of evidence into practice and long-term follow up of the intervention is described in the general discussion chapter of the thesis, the broader process of dissemination, surveillance and monitoring and long-term follow up will be determined by the Cooperative Research Centre for Living with Autism (Autism CRC), with which this study was associated.

Study setting

This study was conducted as part of the Cooperative Research Centre for Living with Autism (Autism CRC), which is the world's first national, cooperative research effort focused on autism across the lifespan (74). The purpose of the Autism CRC is to transform the lives of people living with autism across their lifespan, focusing on diagnosis, education and adult life, through end-user driven research (75). This research project falls under *Program 3: Finding a place in society*, which focuses on adults on the autism spectrum. The aim of Program 3 is to: i) enhance opportunities to successfully transition to post-school life; ii) participate in tertiary education, further training and employment; iii) improve health and well-being; iv) participate meaningfully in community life, and; v) improve economic status. These aims are in line with a major Australian Federal Government priority to increase workforce participation for Australians with disability, as outlined in the National Disability Strategy 2010-2020 (76). Program 3 contains a series of research projects run concurrently across Australia, but led from four different states, as shown in Figure 1.3. The development of the autism-specific workplace tool for employers in this study was led from Western Australia, with related data collected across all states and territories including: Australian Capital Territory (ACT), New South Wales (NSW), Northern Territory (NT), Queensland (QLD), South Australia (SA), Tasmania (TAS), Victoria (VIC) and Western Australia (WA).

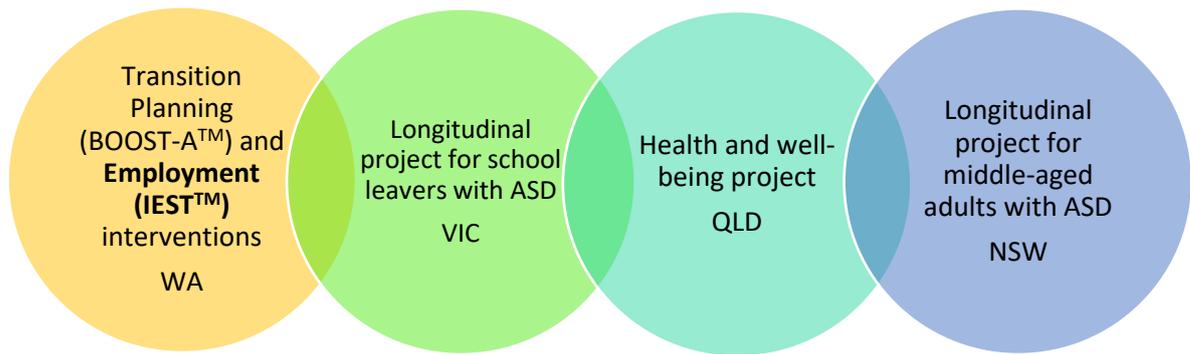


Figure 1.3 Autism CRC projects running concurrently Australia-wide

Overview of thesis structure

The information presented below outlines the purpose and contribution of each of the seven papers in this thesis (Figure 1.4), whereby multiple methods were utilised to explore the role and influence of environmental factors extrinsic to individuals on the autism spectrum and their employment outcomes, as presented in Table 1.1.

Paper I-Scoping literature review

The scoping literature review (Chapter 2) introduces the use of the ICF as a framework to comprehensively examine the extent and range of literature relating to the employment of individuals on the autism spectrum. The scoping review aimed to review the employment literature, explore the measures used in evaluating employment outcomes, identify the skills and abilities of individuals on the autism spectrum that contribute to successful employment, describe and link current employment interventions and programs to the ICF and summarise the outcome of interventions and programs. Paper I contributed to the thesis by providing the justification for the development of an employment intervention targeting environmental factors, instead of intrinsic, personal factors to individuals on the autism spectrum. This justification is influenced through linkage of current employment interventions and programs to the ICF Core Sets for ASD classification system.

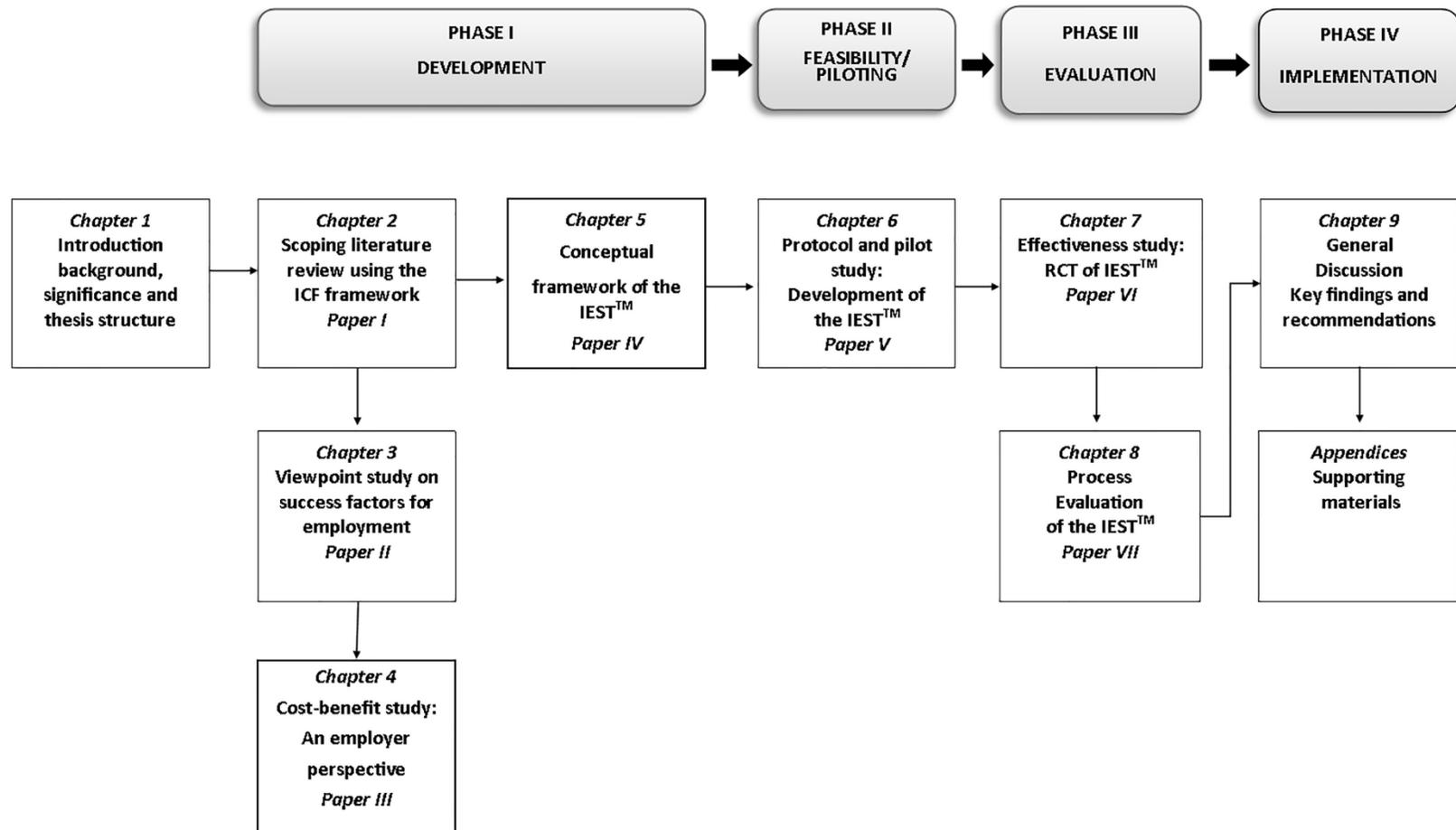


Figure 1.4 Overview of thesis structure and relationship between papers

Paper II-Viewpoint study

Using Q methodology, the viewpoint study (Chapter 3) identified the key factors for successful employment from both the viewpoints of adults on the autism spectrum and their employers, through describing the similarities and differences in their views and how these viewpoints impact on the employment process. Paper II contributed to the thesis by acknowledging the differences in viewpoints for successful employment between adults on the autism spectrum and employers, such that these differences can be used to inform the development of an autism-specific intervention bridging the gap between employees on the autism spectrum and their respective employers by addressing their specific support needs in the workplace.

Paper III-Cost-benefit study

The cost-benefit study (Chapter 4) objectively examined variables of interest including, workplace performance, supervision and training and accommodations to obtain an understanding of the costs and benefits of employing adults on the autism spectrum from the perspective of the employer. Paper III contributed to the thesis through exploring employer attitudes towards hiring and supporting adults on the autism spectrum and addressing the perceived associated costs, a well-recognised environmental barrier to successful employment.

Paper IV- Conceptual framework of the IEST™

The conceptual framework (Chapter 5) described the application of three perspectives underpinning the development and evaluation of the autism-specific workplace tool, the Integrated Employment Success Tool (IEST™) intervention for employers. The three perspective included self-efficacy from Bandura's social cognitive theory (77); the ICF in considering environmental factors (9); and a strengths-based approach of personal factors intrinsic to individuals on the autism spectrum (78). Paper IV contributes to the thesis by providing a comprehensive theoretical underpinning in the design and development of the IEST™, ensuring its feasibility and quality.

Paper V-Protocol and Pilot study

The protocol and pilot study (Chapter 6) described the development and features of the IEST™ intervention, through the application of a conceptual theoretical framework. Piloting of the IEST™ tested for the feasibility and accessibility, and provided formative and process feedback in relation to the required changes to be made, improving the IEST™ prior to the randomised

controlled trial (RCT). Paper V contributed to thesis by providing the rationale for the development and evaluation of the IEST™.

Paper VI-Effectiveness study

The effectiveness study (Chapter 7) reported on the primary outcomes from the RCT, including self-efficacy, knowledge and attitudinal changes in employers modifying the work environment to meet the specific needs of their employees on the autism spectrum. Subsequently evaluating the effectiveness of the IEST™ intervention in comparison to usual workplace supports for employers. Paper VI contributes to the thesis by investigating the relevancy of the IEST™ intervention in real-life workplace contexts Australia-wide with a variety of employers across diverse working environments.

Paper VII-Process Evaluation

The process evaluation study (Chapter 8) explains why the IEST™ intervention was effective by emphasising an evaluation of the implementation, mechanism of impact and the context of the intervention using a mixed-methods approach to obtain feedback from employers using online questionnaires and semi-structured interviews. Paper VII contributes to the thesis by providing clarification in conclusions about the effectiveness of the IEST™ intervention by evaluating the fidelity and quality of the intervention and applicability of generalising the RCT results to the broader Australian context (79).

General Discussion

The general discussion (Chapter 9) provided a synthesis and summary of findings, describing the implications of the results, critically reviewing the strengths and limitations of the research project and suggesting recommendations for future research. The general discussion contributed to the overall thesis by highlighting the impact of environmental factors on employment of adults on the autism spectrum and proposes change through upskilling employers and disability employment service providers in their knowledge and capacity to meet the needs of employees on the autism spectrum.

Table 1.1 Summary of research methods used in each paper

Aspect	Paper I	Paper II	Paper III	Paper IV	Paper V	Paper VI	Paper VII
Design	Scoping review study	Q Methodology study	Online survey study	Conceptual framework of the IEST™	Protocol and pilot study	RCT study	Process evaluation study (mixed-methods approach)
Description	Comprehensive scoping review of factors impacting employment for adults on the autism spectrum using the ICF	Contrasting viewpoints on factors for successful employment for adults on the autism spectrum and employers	Exploring the costs and benefits of employing adults on the autism spectrum in comparison to a matched co-worker	Application of three comprehensive perspectives underpinning the development and evaluation of the IEST™	Development and piloting of the IEST™ intervention	Establishing the effectiveness of the IEST™ group in comparison to usual workplace supports	Exploring the impact of the IEST™ intervention for employers
Sample	K=117 studies (quantitative and qualitative) included for review, k=32, of which were intervention-based	Adults with on the autism spectrum, n=40; Employers, n=35	N=59 employers of adults on the autism spectrum	Three applied perspectives: self-efficacy theory, the ICF framework and strengths-based approach	Piloting with N=12; 2 adults on the autism spectrum, 4 employers, 2 employment coordinators and 4 expert researchers	Employers of individuals on the autism spectrum, n=43 employers allocated to the intervention group and n=41 employers to the control group	N=29 employers from RCT study completed an online survey and a subgroup n=11 employers participated in semi-structured interviews
Data analysis	Frequency, content analyses, linking to ICF Core Sets for ASD	Factor analysis, Factor interpretation, Descriptive statistics, Thematic analysis	Descriptive statistics, ordinal regression, chi-square statistics regression models	N/A	Thematic analysis	Descriptive statistics, Paired and independent t-tests, Wilcoxon-signed rank and Mann-Whitney U tests, two-way ANOVA	Frequency and thematic analyses

References

1. Australian Bureau of Statistics. Disability, ageing and carers, Australia: Summary of Findings. Canberra: ABS; 2015. Contract No.: 4430.0.
2. Centers for Disease Control and Prevention (CDC). Prevalence of autism spectrum disorders – Autism and Developmental Disabilities Monitoring Network, 14 sites, 2008. 2012. Contract No.: SS03.
3. Baxter AJ, Brugha, T. S., Erskine, H. E., Scheurer, R. W. ,Vos, T., & Scott, J. G. The epidemiology and global burden of autism spectrum disorders. *Psychological Medicine*. 2015;45(3):601-13.
4. Swanepoel JA, & Harrison, A.W. The business size distribution in Australia. Canberra: Department of Industry, Innovation and Science; 2015.
5. Fair Work Australia. Employee type 2017 [Available from: <https://www.fairwork.gov.au/employee-entitlements/types-of-employees>].
6. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (5th ed, text rev.). Arlington, VA: American Psychiatric Publishing; 2013.
7. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (4th ed, text rev.). Washington, DC: Author; 2000.
8. Kenny L, Hattersley, C., Molins, B., Buckley, C., Povey, C., & Pellicano, E. Which terms should be used to describe autism? Perspectives from the UK autism community. *Autism*. 2016;20(4):442-62.
9. World Health Organization. International Classification of Functioning, Disability and Health. Geneva: WHO; 2001.
10. World Health Organization. International Classification of Functioning, Disability and Health: Child and Youth version. Geneva: WHO; 2007.
11. Matons JL, & Kowłowski, A.M. The increasing prevalence of autism spectrum disorders. *Research in Autism Spectrum Disorders*. 2011;5:418-25.
12. Idring S, Lundberg M, Sturm H, Dalman C, Gumpert C, Rai D, et al. Changes in Prevalence of Autism Spectrum Disorders in 2001–2011: Findings from the Stockholm Youth Cohort. *Journal of Autism and Developmental Disorders*. 2015;45(6):1766-73.
13. Leonard H, Dixon G, Whitehouse AJO, Bourke J, Aiberti K, Nassar N, et al. Unpacking the complex nature of the autism epidemic. *Research in Autism Spectrum Disorders*. 2010;4(4):548-54.
14. Bishop-Fitzpatrick L, Minshew N, Eack S. A Systematic Review of Psychosocial Interventions for Adults with Autism Spectrum Disorders. *Journal of Autism & Developmental Disorders*. 2013;43(3):687-94.
15. Gerhardt F, & Lainer, I. Addressing the Needs of Adolescents and Adults with Autism: A Crisis on the Horizon. *Journal of Contemporary Psychotherapy*. 2011;41(1):37-45.
16. Shattuck PT, Roux, A., , Hudson, L., Taylor, J., Maenner, M., & Trani, J. Services for Adults With an Autism Spectrum Disorder. *Canadian Journal of Psychiatry*. 2012;57(5):284-91.
17. Howlin P, Arciuli J, Begeer S, Brock J, Clarke K, Costley D, et al. Research on adults with autism spectrum disorder: Roundtable report. *Journal of Intellectual & Developmental Disability*. 2015;40(4):388-93.
18. Shattuck PT, Narendorf, S. C., Cooper, B., Sterzing, P. R., Wagner, M., & Taylor, J. L. Postsecondary education and employment among youth with an autism spectrum disorder. *Pediatrics*. 2012;129(6):1042-9.

19. Wehman P, Schall, C., Carr, S., Targett, P., West, M., & Cifu, G. Transition From School to Adulthood for Youth With Autism Spectrum Disorder: What We Know and What We Need to Know. *Journal of Disability Policy Studies*. 2014.
20. Hendricks DR, & Wehman, P. Transition from school to adulthood for youth with autism spectrum disorders: Review and recommendations. *Focus on Autism and Other Developmental Disabilities*. 2009;24(2):77-88.
21. O'Brien M, Daggett JA. *Beyond the Autism Diagnosis: A Professional's Guide to Helping Families*. Baltimore, MD Brookes Publishing Company 2006 2006. 368 p.
22. Schall C, Cortijo-Doval, E., Targett, P. S., & Wehman, P. Applications for youth with autism spectrum disorders. In: Wehman P, editor. *Life beyond the Classroom: Transition Strategies for Young People with Disabilities*, Fourth Edition. Baltimore, MD: Brookes Publishing Company; 2006. p. 535-75.
23. Hendricks D. Employment and adults with autism spectrum disorders: Challenges and strategies for success. *Journal of Vocational Rehabilitation*. 2010;32(2):125-34.
24. Roux AM, Shattuck, P.T., Cooper, B.P., Anderson, K. A., Wagner, M., & Narendorf, S.C. Postsecondary employment experiences among young adults with an autism spectrum disorder. *Journal of the American Academy of Child & Adolescent Psychiatry*. 2013;52(9):931-9.
25. Wilczynski SM, Trammell B, Clarke LS. Improving employment outcomes among adolescents and adults on the autism spectrum. *Psychology in the Schools*. 2013;50(9):876-87.
26. Lee GK, Carter EW. Preparing transition-age students with high-functioning autism spectrum disorders for meaningful work. *Psychology in the Schools*. 2012;49(10):988-1000.
27. Krieger B, Kinebanian, A., Prodinge, B., & Heigl, F. Becoming a member of the work force: perceptions of adults with Asperger Syndrome. *Work*. 2012;43(2):141-57.
28. Organisation for Economic Co-operation Development. *Sickness, Disability and Work: Keeping on Track in the Economic Downturn*. Organisation for Economic Co-operation and Development Directorate for Employment, Labour and Social Affairs. 2009:1-44.
29. Lawer L, Brusilovskiy, E., & Salzer, M. S., Mandell DS. Use of vocational rehabilitative services among adults with autism. *J Autism Dev Disord*. 2009;39(3):487-94.
30. Baldwin S, Costley, D., & Warren, A. Employment Activities and Experiences of Adults with High-Functioning Autism and Asperger's Disorder. *Journal of Autism and Developmental Disorders*. 2014;44(10):2440-9.
31. de Schipper E, Mahdi S, de Vries P, Granlund M, Holtmann M, Karande S, et al. Functioning and disability in autism spectrum disorder: A worldwide survey of experts. *Autism Research*. 2016;9(9):959-69.
32. Walsh L, Lydon, S., & Healy, O. Employment and Vocational Skills Among Individuals with Autism Spectrum Disorder: Predictors, Impact, and Interventions. *Review Journal of Autism and Developmental Disorders*. 2014;1(4):266-75.
33. Hillier A, Campbell, H., Mastriani, K., Izzo, M. V., Kool-Tucker, A.K., Cherry, L et al. Two-Year Evaluation of a Vocational Support Program for Adults on the Autism Spectrum. *Career Development for Exceptional Individuals*. 2007;30(1):125-34.
34. Chen JL, Leader, G., Sung, C., & Leahy, M. Trends in Employment for Individuals with Autism Spectrum Disorder: a Review of the Research Literature. *Review Journal of Autism and Developmental Disorders*. 2015;2(2):115-27.
35. Shattuck PT, & Roux, A.M. Commentary on employment supports research. *Autism: The International Journal of Research & Practice*. 2015;19(2):246-7.
36. Holwerda A, van der Klink, J. J., Groothoff, J. W., & Brouwer, S. Predictors for work participation in individuals with an Autism spectrum disorder: a systematic review. *J Occup Rehabil*. 2012;22(3):333-52.

37. Kirby AV, Baranek, G. T., & Fox, L. Longitudinal predictors of outcomes for adults with autism spectrum disorder: Systematic review. *OTJR Occupation, Participation and Health*. 2016;36(2):55-64.
38. Erickson WA, von Schrader, S., Bruyère, S,M., & VanLooy, S,A. The Employment Environment: Employer Perspectives, Policies, and Practices Regarding the Employment of Persons With Disabilities. *Rehabilitation Counseling Bulletin*. 2014;57(4):195-208.
39. Ellenkamp J, Brouwers, E., Embregts, P., Joosen, M., & Weeghel, J. Work Environment-Related Factors in Obtaining and Maintaining Work in a Competitive Employment Setting for Employees with Intellectual Disabilities: A Systematic Review. *Journal of Occupational Rehabilitation*. 2016;26(1):56-69.
40. Gilbride D, Stensrud, R., Vandergoot, D., &Golden, K. Identification of the characteristics of work environments and employers open to hiring and accommodating people with disabilities. *Rehabilitation Counseling Bulletin*. 2003;46(3):130-90.
41. Greenwood R, & Johnson, V. A. Employer perspectives on workers with disabilities. *Journal of Rehabilitation*. 1987;53(3):37-45.
42. Unger DD. Employers' Attitudes Toward Persons with Disabilities in the Workforce: Myths or Realities? Focus on Autism and Other Developmental Disabilities. 2002;17(1):2-10.
43. Hernandez B, Keys C, Balcazar F. Employer attitudes toward workers with disabilities and their ADA employment rights: A literature review. *Journal of Rehabilitation*. 2000;66(4):4-16.
44. Bricout JC, & Bentley, K. J. Disability status and perceptions of employability by employers. *Social Work Research*. 2000;24(2):87-95.
45. Dempsey I, & Nankervis, K. Conception of disability. In: Dempsey I, & Nankervis, K., editor. *Community Disability Services: An evidence-based approach to practice*. Sydney, Australia: UNSW Press; 2006. p. 3-26.
46. Stone DL, Colella A. A model of factors affecting the treatment of disabled individuals in organizations. *Academy of Management Review*. 1996;21(2):352-401.
47. Rauch A, Lüickenkemper, M., & Cieza, A. . Introduction to the international classification of functioning, disability and health. In: Bickenbach JE, Cieza, A., Rauch, A., & Stucki, G, editor. *ICF Core Sets: Manual for clinical practice*. Göttingen: Hogrefe Publishing; 2012.
48. Taylor JL, McPheeters, M. L., Sathe, N. A., Dove, D., Veenstra-Vanderweele, J., & Warren, Z. A systematic review of vocational interventions for young adults with autism spectrum disorders. *Pediatrics*. 2012;130(3):531-8.
49. Bishop-Fitzpatrick L, Minschew NJ, Eack SM. A systematic review of psychosocial interventions for adults with autism spectrum disorders. *Journal of Autism and Developmental Disorders*. 2013;43(3):687-94.
50. Hedley D, Uljarevic, M., Cameron, L., Halder, S., Richdale, A., & Dissanayake, C. . Employment programmes and interventions targeting adults with autism spectrum disorder: A systematic review. *Autism*. 2016:1-13.
51. Poon KK, Sidhu DJK. Adults with autism spectrum disorders: a review of outcomes, social attainment, and interventions. *Current Opinion in Psychiatry*. 2017;30(2):77-84.
52. Lounds Taylor J, Dove D., Veenstra-VanderWeele, J., Sathe, N, A., McPheeters, M, L., Jerome, R, N., & Warren, Z. . *Interventions for Adolescents and Young Adults With Autism Spectrum Disorders: Comparative Effectiveness Review*. Rockville, MD: Agency for Healthcare Research and Quality; 2012. Contract No.: AHRQ Publication No. 12-EHC063-EF.
53. Migliore A, Timmons, J., Butterworth, J., & Lugas, J. Predictors of Employment and Postsecondary Education of Youth With Autism. *Rehabilitation Counseling Bulletin*. 2012;55(3):176-84.

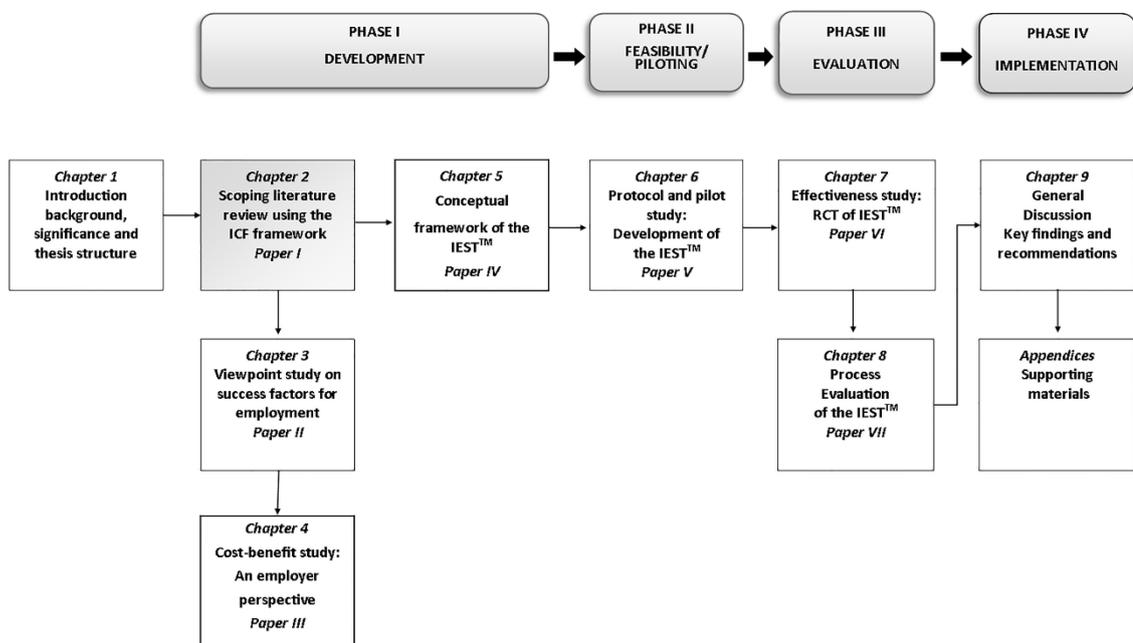
54. Schaller J, & Yang, N. K. Competitive employment for people with autism: correlates of successful closure in competitive and supported employment. *Rehabilitation Counseling Bulletin*. 2005;49(1):4-16.
55. Chen JL, Sung, C., & Pi, S. Vocational Rehabilitation Service Patterns and Outcomes for Individuals with Autism of Different Ages. *Journal of Autism and Developmental Disorders*. 2015;45(9):3015-29.
56. Anderson A, Moore, D. W., Rausa, V. C., Finkelstein, S., Pearl, S., & Stevenson, M. A Systematic Review of Interventions for Adults with Autism Spectrum Disorder to Promote Employment. *Review Journal of Autism and Developmental Disorders*. 2017;4(1):26-38.
57. Wehman P, Schall CM, McDonough J, Graham C, Brooke V, Riehle JE, et al. Effects of an employer-based intervention on employment outcomes for youth with significant support needs due to autism. *Autism*. 2016:1-15.
58. Nicholas D, Attridge, M., Zwaigenbaum, L., & Clarke, M. Vocational support approaches in autism spectrum disorder: A synthesis review of the literature. *Autism*. 2014.
59. Wehman PH, Schall, C. M., McDonough, J., Kregel, J., Brooke, V., Molinelli, A., et al. Competitive employment for youth with autism spectrum disorders: Early results from a randomized clinical trial. *Journal of Autism & Developmental Disorders*. 2014;44:487-500.
60. Richards J. Examining the exclusion of employees with Asperger syndrome from the workplace. *Personnel Review*. 2012;41(5):630-46.
61. Müller E, Schuler, A., Burton, B. A., & Yates, G. B. Meeting the vocational support needs of individuals with Asperger syndrome and other autism spectrum disabilities. *Journal of Vocational Rehabilitation*. 2003;18:163-75.
62. Cimera RE, & Cowan, R. J. The costs of services and employment outcomes achieved by adults with autism in the US. *Autism*. 2009;13(3):285-302.
63. Australian Department of Human Services. National Disability Insurance Scheme 2010 [Available from: <https://www.ndis.gov.au/index.html>].
64. Kastner M, & Straus, S.E. Application of the Knowledge-to-Action and Medical Research Council frameworks in the development of an osteoporosis clinical decision support tool. *Journal of Clinical Epidemiology*. 2012;65(11):1163-70.
65. Medical Research Council. Developing and evaluating complex interventions: new guidance. 2008.
66. Craig P, Dieppe, P., Macintyre, S., Mitchie, S., Nazareth, I., & Petticrew, M. Developing and evaluating complex interventions: The new Medical Research Council guidance. *BMJ*. 2008;337(7676):979-83.
67. Medical Research Council. A framework for development and evaluation of RCTs for complex interventions to improve health. MRC; 2000.
68. Campbell NC, Murray E, Darbyshire J, Emery J, Farmer A, Griffiths F, et al. Designing and evaluating complex interventions to improve health care. *BMJ*. 2007;334(7591):455.
69. Hardeman W, Sutton S, Griffin S, Johnston M, White A, Wareham NJ, et al. A causal modelling approach to the development of theory-based behaviour change programmes for trial evaluation. *Health Education Research*. 2005;20(6):676-87.
70. Kirsh B. Organizational culture, climate and person-environment fit: relationships with employment outcomes for mental health consumers. *Work*. 2000;14(2):109-22.
71. Medical Research Council. Process evaluation for complex interventions: UK Medical Research Council (MRC) guidance. MRC; 2015.
72. Campbell MD, Fitzpatrick R, Haines A, Kinmonth A, Sandercock P, Spiegelhalter D, et al. Framework for design and evaluation of complex interventions to improve health. *BMJ*. 2000;321:694-6.

73. Faes MC, Reelick, M.F., Esselink, R.A., & Rikkert, M. G. O. Developing and Evaluating Complex Healthcare Interventions in Geriatrics: The Use of the Medical Research Council Framework Exemplified on a Complex Fall Prevention Intervention. *Journal of the American Geriatrics Society*. 2010;58(11):2212-21.
74. Cooperative Research Centre for Living with Autism (Autism CRC). Autism CRC 2014 [Available from: <https://www.autismcrc.com.au/>].
75. The Cooperative Research Centre for people living with Autism (Autism CRC). Autism CRC 2013 [Available from: <http://www.autismcrc.com.au/>].
76. Council of Australian Governments. National Disability Strategy 2010-2020: An initiative of the Council of Australian Governments. Canberra: ACT; 2011.
77. Bandura A. Social foundations of thought and action: A social cognitive theory. Engelwood Cliffs, NJ: Prentice-Hall; 1986.
78. Russo RJ. Applying a strengths-based practice approach in working with people with developmental disabilities and their families. *Families in Society*. 1999;80(1):25-33.
79. Moore GF, Audrey S, Barker M, Bond L, Bonell C, Hardeman W, et al. Process evaluation of complex interventions: Medical Research Council guidance. *BMJ (Online)*. 2015;350.

Chapter 2: Paper I-Scoping literature review using the ICF framework

Preface

Chapter 2 presents a scoping review of the literature in relation to the employment of individuals on the autism spectrum. The aim of this scoping review is to examine the employment literature, explore the measures used in evaluating employment outcomes, identify the skills and abilities of individuals on the autism spectrum that contribute to successful employment, describe and link current employment interventions and programs to the ICF Core Sets for ASD and summarise the outcome of interventions and programs. This chapter highlights the gaps in the current literature specifically regarding current employment interventions and programs and provides the justification for the development of an employment intervention targeting environmental factors.



This manuscript was accepted for publication on 18 June 2018. Due to copyright restrictions only, the post-print version has been included in the thesis as a typescript. Please note, copyright remains with the journal.

Scott M, Milbourn, B., Falkmer, M., Black, M., Bölte, S., Halladay, A., Lerner, M., Taylor, J.L, & Girdler, S. Factors impacting employment for people with Autism Spectrum Disorders: A scoping review. Autism. 2018; doi:10.1177/1362361318787789

Factors Impacting Employment for People with Autism Spectrum Disorder: A Scoping Review

Melissa Scott^{1,2}, Ben Milbourn¹, Marita Falkmer^{1,2,3}, Melissa Black^{1,2}, Sven Bölte^{4,5}, Alycia Halladay^{6,7}, Matthew Lerner⁸, Julie Lounds Taylor^{9,10,11} and Sonya Girdler^{1,2}

¹School of Occupational Therapy and Social Work, Curtin University, Perth, Australia.

² Cooperative Research Centre for Living with Autism (Autism CRC), Long Pocket, Brisbane, Australia

³School of Education and Communication, CHILD programme, Institute of Disability Research, Jönköping University, Jönköping County, Sweden

⁴Center of Neurodevelopmental Disorders (KIND), Division of Neuropsychiatry, Department of Women's and Children's Health, Karolinska Institutet, Stockholm, Sweden

⁵Child and Adolescent Psychiatry, Center for Psychiatry Research Stockholm County Council, Stockholm, Sweden

⁶Autism Science Foundation, New York, United States

⁷ Department of Pharmacology and Toxicology, Rutgers University, Piscataway, New Jersey

⁸Department of Psychology, Stony Brook University, Stony Brook, New York, United States

⁹ Vanderbilt Kennedy Center, Nashville Tennessee

¹⁰ School of Medicine, Vanderbilt University, Nashville, Tennessee

¹¹The Monroe Carell Jr. Children's Hospital at Vanderbilt, Nashville, Tennessee

Corresponding author:

Sven Bölte, Center of Neurodevelopmental Disorders (KIND), Division of Neuropsychiatry, Department of Women's and Children's Health, Karolinska Institutet, Stockholm, Sweden

Email: sven.bolte@ki.se

Acknowledgements

Thank you to Emeritus Professor Sylvia Rodger AM, whose passion and commitment to creating a more inclusive community guided the continuous pursuit for improved employment outcomes for people on the autism spectrum. Our sincere thanks to Christopher Esposito and Alan Gerber for their time, feedback and guidance in this scoping review. Thank you to the community reference group for their valuable input and direction in the review.

Declaration of Conflicting Interests

Professor Sven Bölte and Associate Professor Julie Lounds Taylor are both co-authors on the manuscript for submission, as well as sub-editors for Autism. Please consider this when reviewing and/or publishing the manuscript as a potential conflict of interest.

Funding

This work was supported by the International Society for Autism Research (INSAR). The authors also wish to acknowledge the financial support the Cooperative Research Centre for Living with Autism (Autism CRC), established and supported under the Australian Government's Cooperative Research Centres Program. The authors acknowledge the financial support of Curtin University to Melissa Scott through the Australian Postgraduate Award Scholarship. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Abstract

Aim: To holistically synthesise the extent and range of literature relating to the employment of individuals with autism spectrum disorder (ASD).

Methods: Database searches of Medline, CINAHL, PsychINFO, Scopus, ERIC, Web of Science and EMBASE were conducted. Studies describing adults with ASD employed in competitive, supported or sheltered employment were included. Content analysis was used to identify the strengths and abilities in the workplace of employees with ASD. Lastly, meaningful concepts relating to employment interventions were extracted and linked to the International Classification of Functioning, Disability and Health (ICF) Cores Sets for ASD.

Results: The search identified 134 studies for inclusion with methodological quality ranging from limited to strong. Of these studies, only 36 evaluated employment interventions that were coded and linked to the ICF, primarily focusing on modifying ASD characteristics for improved job performance, with little consideration of the impact of contextual factors on work participation.

Conclusion: The ICF Core Sets for ASD are a useful tool in holistically examining the employment literature for individuals with ASD. This review highlighted the key role that environmental factors play as barriers and facilitators in the employment of people with ASD and the critical need for interventions which target contextual factors if employment outcomes are to be improved.

Keywords

Adult, intervention, strengths-based, vocational rehabilitation, work environment

Introduction

Autism spectrum disorder (ASD) is a lifelong neurodevelopmental condition with adult outcome studies revealing that few individuals with ASD live independently, have social relationships, or are employed, experiencing poor mental health and overall quality of life (Hendricks and Wehman, 2009; Howlin et al., 2013; Kirby et al., 2016; Levy and Perry, 2011; Magiati et al., 2014; Seltzer et al., 2004). However, some adults with ASD successfully gain post-secondary qualifications, participate in long-term employment, live independently and engage in social and romantic relationships (Eaves and Ho, 2008; Farley et al., 2009; Billstedt and Gillberg, 2005). It is likely that this variability in outcomes is, at least in part, attributable to the heterogeneity of ASD and variability in personal factors, such as intelligence quotient, language abilities, comorbid conditions (Howlin et al., 2004; Henninger and Taylor, 2013; Farley et al., 2009; Kirby et al., 2016; Magiati et al., 2014), environmental factors including family support, access to interventions, and the availability of support services (Holwerda et al., 2012; Levy and Perry, 2011). While research to date has largely focused on impairment, ASD may also be associated with strengths with the potential to leverage improvements in functioning and quality of life (de Schipper et al., 2015; Mottron et al., 2009).

Individuals with ASD possess strengths and abilities, which can be harnessed in the work environment, often performing well in jobs requiring systematic information processing and a high degree of accuracy, precision and repetition (Baldwin et al., 2014; de Schipper et al., 2016; Walsh et al., 2014). Capitalising on these strengths (Clifton and Harter, 2003) and focusing on the person-job-environment fit (Lorenz and Heinitz, 2014) could support successful outcomes for people with ASD in a variety of employment contexts (Hendricks, 2010; Mawhood and Howlin, 1999). However, despite increasing recognition of the

potential contribution that individuals with ASD can make in the workplace, they continue to experience many challenges securing and maintaining employment (Hendricks, 2010; Hurlbutt and Chalmers, 2004; Howlin and Moss, 2012). This is partly driven by models of service which continue to focus on remediating impairments, with little regard for the strengths of people with ASD, perpetuating low expectations and ultimately poor employment outcomes (Holwerda et al., 2012; Lorenz and Heinitz, 2014).

Australian adults with ASD participate in employment at a rate of 42%, in comparison to 53% of all individuals with disabilities, and 83% of individuals without disabilities (Australian Bureau of Statistics, 2009; Australian Bureau of Statistics, 2010). In the United Kingdom, 15% of adults with ASD of working age are in full-time paid employment (Mavranouzouli et al., 2013; Rosenblatt, 2008), and only 34% (aged 21-48 years) have ever participated in 'some' form of employment, inclusive of independent work, self-employed or sheltered employment (Howlin et al., 2004). Similarly, in the United States 58% of young adults (aged 18-25 years) with ASD have worked for pay, and only 21% are in full-time employment (Bureau of Labor Statistics, 2013; Roux et al., 2015). While some individuals with ASD do find employment, many work in positions below their qualifications or skill level, working reduced hours and receiving lower rates of pay than their co-workers in comparative positions (Roux et al., 2015; Shattuck et al., 2012; Howlin et al., 2004). At the individual level, poor employment outcomes among adults with ASD negatively impact socioeconomic status, quality of life and mental health (Gerhardt and Lainer, 2011; Wanberg, 2012; Fleming et al., 2013), and at the societal level on lost productivity and increased reliance on government funding (Krieger et al., 2012; Järbrink et al., 2007; Roux et al., 2013).

Employment commonly occurs within environments that are potentially challenging for individuals with ASD (Leonard et al., 2010; Müller et al., 2003; Nord et al., 2016). In the life area of work and employment, the hallmark impairments of ASD manifest in difficulties mastering the job application process, remembering and following instructions, interacting and communicating effectively with co-workers, and integrating into the workplace culture (Baldwin et al., 2014; Krieger et al., 2012; Müller et al., 2003). It is however likely that the low levels of participation in employment are influenced by environmental factors such as employers' attitudes and concerns over real and perceived barriers to employing individuals with ASD including accommodation costs, additional supervision needs, sick leave, workforce heterogeneity and concern in relation to employee productivity (Unger, 2002; Ju et al., 2013; Hernandez and McDonald, 2010). Common employment processes and practices such as traditional approaches to job advertising and interviewing (Strickland et al., 2013; Scott et al., 2015) and job descriptions requiring generic skills such as teamwork and social-communication skills that are not always essential to the job role, are also likely barriers to securing employment for this group (Fraser et al., 2011; Richards, 2012).

Employment services assist individuals with ASD with recruitment, the interview process, job placement, workplace accommodations and ongoing support. While employment services aim at maximizing employment outcomes for individuals with ASD, they remain less than optimal and do not provide sufficient and appropriate supports (Lawer et al., 2009; Nicholas et al., 2014; Alverson and Yamamoto, 2016; Anderson et al., 2017). Often employment services overlook the social support needs and on-the-job training required by employees with ASD and have a tendency to treat their needs homogeneously (Richards, 2012; Nicholas et al., 2014). Many employment service providers are not trained to comprehensively meet the unique and varying needs of ASD, nor do they have an

understanding of the strengths of this population to assist with providing individualised ASD-specific support for employment success (Chen et al., 2015a; Müller et al., 2003). The costs associated with providing vocational supports for ASD may also be a barrier for employment services. The ASD group is considered one of the most costly populations to support in employment, receiving the highest varying and number of supports, remaining longer in the service system yet achieving comparatively poorer employment outcomes to other disabilities (Cimera and Cowan, 2009; Burgess and Cimera, 2014; Chen et al., 2015b; Seaman and Cannella-Malone, 2016). This is problematic given the increasing number of individuals with ASD requiring and utilising vocational support services (Burgess and Cimera, 2014). It is essential that our understanding about the type and level of support required improves, along with the role that extrinsic social and environmental factors play in fostering employment success for individuals with ASD (Nicholas et al., 2014; Kirby et al., 2016).

Employment for adults with ASD can be holistically conceptualised using the *International Classification of Functioning, Disability and Health* (ICF) framework. The ICF takes a biopsychosocial perspective of health, providing a scientific basis and standardised language for coding and classifying health and health-related states (World Health Organization, 2001). The classification of health and health-related states are described in two parts, each consisting of two components. *Part 1 'Functioning and Disability'* includes the components of, *Body Functions and Structures* (i.e., physiological functioning and anatomical parts of the body) and *Activities and Participation* (i.e., execution of a task and involvement in a life situation respectively). *Part 2 'Contextual Factors'* includes the components of, *Environmental factors* (i.e., physical, social and attitudinal environment) and *Personal Factors* (i.e., social and cultural factors intrinsic to the individual) (World Health Organization, 2001). Using taxonomic principles and a hierarchical structure, the ICF

organises three of the distinct components described above (i.e., Body Functions and Structures, Activities and Participation and Environmental Factors) into four levels of increasing detail (World Health Organization, 2001). The first level of categorisation refers to the relevant chapters within the ICF, with each chapter providing a general overview of the areas of functioning. Each chapter comprises of second, third and fourth level categories. For example, an ASD-relevant classification from the *Activities and Participation* component shows the hierarchical structure of the ICF:

- Level 1 chapter: d7 Interpersonal interactions and relationships
- Level 2 category: d710 Basic interpersonal interactions
- Level 3 category: d7104 Social cues in relationships
- Level 4 category: d71040 Initiating social interactions

The ICF perceives an individual's functioning and disability as a dynamic process resulting from interactions between the health condition and contextual factors, i.e., the outcome of work participation and employment is a result of the interaction of an individual with ASD and the environmental factors (McDougall et al., 2010; World Health Organization, 2001; Schneidert et al., 2003). Given the many factors influencing work participation and employment of individuals with ASD, the ICF framework is useful in capturing this complex group of intertwined variables and organising this information in a meaningful, interrelated and easily accessible way (World Health Organization, 2001). However, with more than 1650 categories to describe an individual's functioning, using the ICF in its entirety remains too generic and unfeasible (Finger et al., 2012; Stuckl et al., 2002). In an attempt to address this limitation, 'ICF Core Sets, or a condensed list of categories or domains of the ICF relevant to a specific health condition (e.g., ASD) or setting (e.g., the workplace)' (Finger et al., 2012)^[p430], have been defined. The development of the ICF Core Sets for ASD enables

consideration of functioning across the lifespan and understanding of participation in major life areas, including employment (Bölte et al., 2014; de Schipper et al., 2015; de Schipper et al., 2016; Bölte et al., 2017). The implementation of the ICF Core Sets for ASD will be particularly useful in organising the ASD employment literature according to the target of interventions in relation to *Body functions* and *Activities and Participation*, and the modality of the interventions in relation to *Environmental factors*. The organisation of the ASD employment literature will highlight the gaps in current employment interventions, while re-inforcing successful interventions and their associated outcomes.

Although the number studies examining employment interventions and outcomes has almost doubled in recent years, much remains unknown. This scoping review examines the extent and range of literature relating to the employment of individuals with ASD, employing the ICF as a framework to summarise and synthesise findings with the goal of informing future research and policy, and advancing evidence-based practice. As such, the primary objectives of this review were to: i) holistically and comprehensively review the employment literature and employ the ICF framework (World Health Organization, 2001); ii) explore measures used in evaluating employment outcomes; iii) identify the skills and abilities of individuals with ASD that contribute to successful employment; iv) describe, classify and link to the ICF current employment programs and interventions in ASD (Cieza et al., 2005); and v) summarise the overall outcomes of interventions and support programs.

Methods

A scoping review examined the employment of individuals with ASD, supporting the mapping of key concepts underpinning the research, synthesising the literature and identifying gaps in the evidence, ultimately supporting the dissemination of findings to consumers, researchers and policy makers (Arksey and O'Malley, 2005). The review

adopted the methodology for scoping reviews articulated by Arksey and O'Malley's (Arksey and O'Malley, 2005) and refined by Daudt et al. (Daudt et al., 2013) and Levac et al. (Levac et al., 2010), in: (a) identifying the research aims and objectives; (b) searching for relevant studies; (c) systematically selecting studies; (d) charting data; (e) collating, summarising and reporting the results including a methodological assessment of quality; and (f) consulting with stakeholders to inform or validate study findings (Arksey and O'Malley, 2005).

Search strategy

Scoping search strategies promote a comprehensive and broad search of the literature, employing multiple sources (Levac et al., 2010). The literature was searched using electronic databases Medline (1966), CINAHL (1982), PsychINFO (1920), Scopus (1960), ERIC (1992), Web of Science (1972) and EMBASE (1947) for publications from their earliest records to their most recent (June 2018). A further computer search of reference lists of all relevant retrieved articles identified additional significant papers, and employment policies, reports and proceedings retrieved from relevant government websites, networks and organisations. Search terms used were grouped in relation to: (i) diagnosis; (ii) age; (iii) intervention; and, (iv) outcome (Table 1). Combinations of search terms were identified, truncated, exploded and adjusted to achieve optimal results with the assistance of a librarian to comply with each of the databases.

Table 1. Search terms^a

Diagnosis	Age	Intervention	Outcome
autis*, autism spectrum disorder, asperger*, pervasive development* disorder*, autistic disorder*	adult*, adolescent*, youth, young adult*	support*, service, program, training, vocation* rehabilitation provider, strategy, intervention, accommodation*, employer*, supervisor*, manager*, environment*	employ*, work*, job, vocation*, occupation*, participation, competitive employ*, supported employ*, sheltered employ*

^aTerms were connected with 'OR' and between terms with 'AND'

*Search terms truncated and exploded

Study selection

The scoping review process is iterative, involving a multidisciplinary team to ensure a transparent, replicable and rigorous process (Levac et al., 2010). Authors defined and refined the inclusion criteria, based on increasing familiarity with the literature (Arksey and O'Malley, 2005). Following the inventorying and study of abstracts, the research question was revised. Studies were included if, i) participants were individuals with ASD (including autism, Asperger's disorder or pervasive developmental disorder not otherwise specified (PDD-NOS), with or without an intellectual disability, and 18 years or older. Although the inclusion criteria stipulated participants should be 18 years and older, studies were included if a subset of the participants were under the age of 18, but the mean age of participants was ≥ 18 years; ii) described the process of finding, gaining and maintaining employment (including the terms competitive, supported, sheltered employment, vocational activities, work experience or internships); iii) reported the use of any employment programs, interventions or vocational supports and iv) published or translated in English. Studies were excluded if the documents were a book or book chapter, editorial or opinion piece, and if they focused on transition planning. Four reviewers independently assessed the relevance of the selected articles.

Charting the data

Data were extracted from the selected articles according to the pre-determined framework (Arksey and O'Malley, 2005). Descriptive study characteristics were charted and organised by unique reference number, author, year of publication, country, design, participants, outcome measures, nature and stage of employment and quality and level of evidence.

Assessment of methodological quality

Methodological quality was independently assessed by two reviewers according to the *Standard Quality Assessment Criteria for Evaluating Primary Research Papers from a Variety of Fields* (Kmet et al., 2004), comprising a checklist of 10 items for qualitative studies and 14

items for quantitative studies, underpinning calculation of an overall score of study quality. Scores were represented as percentages with the strength of the evidence categorised as strong (> 80%), good (70-80%), adequate (50-70%) or limited (< 50%) (Lee et al., 2008). Any inconsistencies between reviewers were resolved by discussion. The same two reviewers also determined the level of evidence of each study based on the guidelines developed by the Joanna Briggs Institute (The Joanna Briggs Institute, 2014).

Collating, summarising and reporting the results

Search results were analysed using a combination of techniques. Descriptive analysis characterised included studies, mapping the data, revealing the distribution of studies across employment type, focus of employment programs or interventions and overall employment outcomes (direct and indirect). Assessment of the methodological quality of included studies provided an understanding of the strength of the evidence in relation to the study design (Kmet et al., 2004). Content analysis was used to analyse the content of the literature according to the pre-established categories of “ASD-related abilities” as described by de Schipper et al. (de Schipper et al., 2016), quantitatively investigating the frequency of the terms relating to ASD-related skills and abilities, and qualitatively focusing on the meaning and interpretation of the strengths that individuals with ASD contribute to the workplace (Joffe and Yardley, 2004).

Identifying and linking meaningful concepts to the ICF

Meaningful concepts were identified and extracted in relation to the target and modality of the intervention and then linked to the *Body functions, Activities and Participation* and *Environmental factors* components according to the linking rules and procedures described by Cieza et al. (Cieza et al., 2005; Cieza et al., 2002). In cases where concepts were too broad and ICF categories could not be identified, specific codes were assigned, including; a) “not definable (nd)”, when information provided by a meaningful concept was not sufficient to assign to an ICF category; b) “personal factor (pf)”, when a concept was not contained in

the ICF, but was clearly a personal factor as defined by the ICF; c) “*not covered (nc)*”, when a concept was not contained within the ICF and was clearly not a personal factor; and d) “*health condition (hc)*”, when a concept referred to diagnosis or condition (Cieza et al., 2005). Identification and linkage of meaningful concepts to ICF categories were conducted independently by four researchers with linking experience, ensuring the quality and consistency of the results. Linking results of each of the researchers were compared, with any variance discussed to verify concepts and categories until consensus was reached.

Application of the ICF Core Sets for ASD

The linking process was informed by the ICF Core Sets for ASD (Bölte et al., 2017), which have been developed in response to the need for a standardised tool describing functioning in ASD across the lifespan (Bölte et al., 2014; Selb et al., 2015), with this review employing the *brief* ICF Core Sets for ASD inclusive of those categories essential in describing ASD (Cieza et al., 2004; Finger et al., 2012). The application of the *brief* ICF Core Sets for ASD was useful in identifying the targets of employment programs and highlighting the potential targets of future interventions. The targets, modality and outcomes of employment programs and interventions were linked to the *brief* ICF Core Sets for ASD at the second-level. Further linkage to the third and fourth-level was undertaken using the ICF Children and Youth version (ICF-CY) (World Health Organization, 2007), as a supplement to the core sets. The frequency of each category was counted in accordance with the rule that if the same category was assigned more than once to the same employment program or intervention, it was counted only once in the analysis (Selb et al., 2015).

Consulting with stakeholders

While considered an optional step in the review process (Arksey and O'Malley, 2005), consultation with consumers and the community was deemed an important and useful step in guiding all aspects of the review. Consultation with a community reference group occurred throughout the analysis and reporting of this review to validate findings and inform further stages of the research project.

Results

A total of 4,114 references were identified, reduced to 2,434 after the removal of duplicates and inappropriate reference types. Article titles and abstracts were reviewed according to the inclusion criteria, and when information for inclusion was lacking, full text copies of the articles were retrieved and reviewed, with a final $K=134$ articles meeting the inclusion criteria (Figure 1). The majority of identified articles were from the United States ($k=87$), followed by the United Kingdom ($k=12$), Australia ($k=8$) and Sweden ($k=4$). Eighty-four studies were quantitative, of which 22 studies extracted information from national databases rather than directly from participants, 44 were qualitative in design and five were reports and one used a mixed-methodology design. Given the high number of articles included in this review, the analysis of the 134 articles were divided into two categories, i) general articles relating to employment outcomes ($k=98$); and, ii) articles evaluating employment programs and interventions ($k=36$).

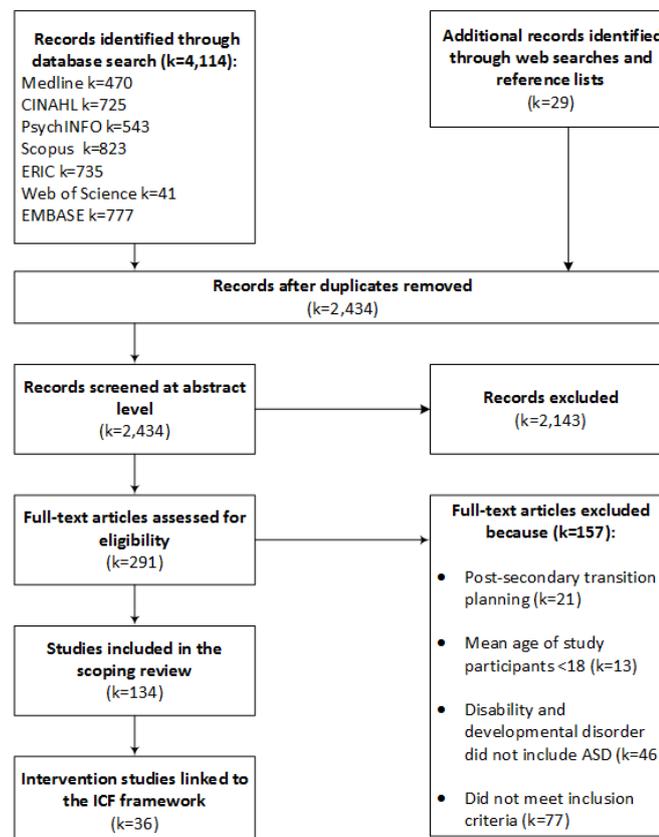


Figure 1. Flowchart of study selection process

General articles relating to employment outcomes (k=98)

Quality assessment of studies and levels of evidence

A broad range of evidence was identified. The majority of research articles were rated from level II (quasi-experimental designs) through level V (expert opinion and bench research), with only four articles rated as level I evidence, according to the Joanna Briggs Institute hierarchy of scientific evidence for meaningfulness.

Overall the methodological quality of the included articles ranged from limited ($k=18$), to adequate ($k=16$), to good ($k=12$) to strong ($k=52$). (Kmet et al., 2004). Shortcomings of quantitative studies ($k=59$) included the absence of control groups, a lack of random allocation, small sample sizes, implementation of poorly described or non-standard interventions, along with non-blinded assessments and imprecise measurements of outcomes. Qualitative studies ($k=33$) were limited by failures to adequately report methodological design and procedures including the absence of discussion in relation to if findings achieved a saturation, participants self-selecting as having ASD rather than confirmation of diagnosis, collectively impacting on the transferability and credibility of findings. Table 2 summarises the descriptive characteristics of the employment outcome studies only ($k=98$).

Employment settings

Articles were categorised according to employment type, including vocational skills training, such as work experience or an internship, and sheltered, supported or competitive employment. The majority of articles ($k=98$) focused on participants with ASD finding and securing roles in paid, supported or competitive employment, while 16 studies investigated work experience or vocational skills training with the goal of individuals eventually obtaining supported or competitive employment (Allen et al., 2010a; Allen et al., 2010b; Arikawa et al., 2013; Briel and Getzel, 2014; Burgess and Cimera, 2014; Burke et al., 2010; Burke et al., 2013; Dotson et al., 2013; Gal et al., 2015b; Gilson and Carter, 2016; Hayes et

al., 2015; Seaman and Cannella-Malone, 2016; Anderson et al., 2017; Baker-Ericzen et al., 2018; Rosen et al., 2017; Walsh et al., 2018). One study explored whether participating in sheltered workshops prior to engaging in supported open employment improved vocational outcomes for individuals with ASD (Table 2) (Cimera et al., 2012). A cluster of 20 articles explored and compared vocational outcomes across a variety of employment settings in

Table 2. Descriptive characteristics of general articles relating to employment outcomes (*k*=98)

Author, year, country	Design	Participants	Outcome measures	Type of employment				Employment stage			Quality and level of evidence
				W/I / VT	S	SE	C	P	S	M	
Alverson et al., 2017, USA	Retrospective observational study using national database	Individuals diagnosed with ASD who were clients of VR services in the USA; N=49,623 (81% - 84% male from 2003 to 2012).	Using a database description of employment outcomes relating to: highest level of education attained at client's application, individual education plan status, employment status at application and case closure, total services received.				X		•		Strong (18/22) III
Anderson et al., 2017, Australia	Systematic review	Individuals diagnosed with ASD; N=62 (58 males, 4 females), Age: 14-42 years.	Quality and methodological assessment of evidence, classification of studies and treatment effects and replication standards	X	X	X	X	•			Strong (19/20) II
Andersson et al., 2015, Sweden	Online vignette study	Employers with hiring responsibilities N=212 (109 females, 100 males); Age: <i>M</i> =45 (11.47)	Questionnaire on employers' attitudes towards persons with various disabilities				X	•			Strong (19/22), V
Autism Europe, 2014, Czech Republic	Report	Individuals diagnosed with ASD	N/A		X	X		•	•	•	Limited (5/20), N/A
Autism Speaks, 2012, USA	Descriptive report	Stakeholders including individuals with ASD, family members, VR counsellors, service providers, academic experts and business leaders and entrepreneurs.	N/A				X		•	•	Limited (0/20), V
Autism Spectrum Australia, 2013, Australia	Online cross-sectional survey	Individuals diagnosed with AS or HFA; N=313 (71% male, 29% female); Age: <i>Mdn</i> =30 years (18-70 years)	Questionnaires profiling the experiences, needs and aspirations of adults with AS/HFA				X			•	Good (15/20), N/A
Baldwin et al., 2014, Australia	Online cross-sectional survey	Individuals diagnosed with AS, HFA, ASD or PDD-NOS; N=130 (88 males, 42 females); Age: <i>M</i> =35.6 (12.4)	Questionnaire on employment outcomes relating to: Type of occupation, occupational skill level, hours of work, type of job contract, workplace support, employment experiences				X			•	Strong (16/20), IV
Briel et al, 2014., USA	Structured interviews	Individuals diagnosed with ASD; N=18 (18-43 years; 15 males, 3 females)	Two-part interview instrument including demographic data and 7 open-ended questions	X				•			Adequate (13/20), V
Burgess and Cimera, 2014, USA	Case report database analysis	Individuals diagnosed with ASD; N=34, 501 (82.2% male, 17.8% female); Age: <i>M</i> = 20.32 years	Using a dataset description of employment outcomes relating to: successful employment, hours worked, wages earned, costs of services				X			•	Good (15/22), III

Table 2. Continued

Author, year, country	Design	Participants	Outcome measures	Type of employment				Employment stage		Quality and level of evidence
				W/I / VT	S	SE	C	P	S	
Bush and Tassé, 2017, USA	Retrospective observational study using national database	Individuals diagnosed with ASD; N=2174 (76.7% male, 23.3% female), Age: M=34.53 (SD: .12.61) years Individuals with Down syndrome; N=1857 (53.9% male, 46.1% female), Age: M=40.87 (SD: .12.03) years Individuals with idiopathic intellectual disability; N=15,845 (54.3% male, 45.7% female), Age: M=44.77 (SD: 15.10) years	Using database description of employment factors relating to: demographic factors and ability to make 'choices' (such as choosing where you live, choosing case manager).		X		X		•	Strong (22/22) III
Capo, 2001, USA	Case study	Individual diagnosed with ASD; N=1 (22-year-old female)	Self-report				X		• • •	Limited (7/20), IV
Chen et al., 2015a, USA	Narrative literature review	Individuals diagnosed with ASD	N/A				X		•	Limited (9/20), IV
Chen et al., 2015b, USA	Case report database analysis	Individuals diagnosed with ASD; N= 5681 Transition group: n=2718 (18 years or younger; 2290 males, 428 females) Transition young adults: n=2162 (19-25; 1812 males, 349 females) Adults: n=801 (26 years and older; 669 males, 132 females)	Using a dataset description of employment outcomes relating to: employment status, hourly wages, hours worked, association of demographic covariates, success of rehabilitative services				X		• • •	Strong (15/18), IV
Cimera and Cowan, 2009, USA	Retrospective observational study	Individuals diagnosed with ASD; N= 11, 569 (80.3% males, 19.7% females); Age: M=28.8	Using a dataset description of employment outcomes relating to: cost of services, changes in wages earned and hours worked, successfully or unsuccessfully employed, conversion to dollar values				X		•	Good (14/18), III
Cimera and Burgess, 2011, USA	Retrospective observational study	Individuals diagnosed with ASD; N=19,436 (80.4% male, 19.5% female); Age: M=25.2	Using a dataset description of employment outcomes relating to: employment status, hours worked, wages earned, taxes paid, forgone wages, subsidies received, cost-efficiency, conversion to dollar values				X		• •	Good (14/18), III
Cimera et al., 2012, USA	Case-control study	Individuals diagnosed with ASD; N=530 Sheltered: n=215 (80% males, 20 females); Age: M=31.12 (9.07) Non-sheltered: n=215 (80% males, 20% females); Age: M=37.75 (8.9)	Using a dataset description of employment outcomes relating to: disabilities, rate of employment, wages earned, hours worked, cost of services		X				•	Good (14/18), IV

Table 2. Continued

Author, year, country	Design	Participants	Outcome measures	Type of employment			Employment stage			Quality and level of evidence
				W/I /VT	S	SE	C	P	S	
Ditchman et al., 2017, USA	Network analysis using a national database	Individuals with ASD receiving VR services in the USA; N=2,129 (1,794 males, 335 females). Age: M=18.55 (SD:192) years	Using database description of employment factors relating to: demographics, employment outcomes and VR services received.				X		•	Strong (22/22) III
Foley and Staples, 2003, USA	Case study	Individuals diagnosed with ASD and ID; N=3 (22-35 years, all male)	Caregivers and staff communication needs survey, adapted measures for phonemic awareness, knowledge of letter sound, word identification, text comprehension and developmental spelling, parts of the Test of Early Reading Ability (TERA) Autism Work Skills Questionnaire (AWSQ)			X		•	•	Adequate (11/20), IV
Gal et al., 2015a, Israel	Case-control study	Individuals diagnosed with HFASD and individuals without disabilities, N=139 With HFASD: n=37 (30 males, 7 females); Age: M=25.37 (6.94) Without HFASD: n=102 (77 males, 25 females); Age: M=24.71 (4.79)	Quality of Life questionnaire (QOL-Q); Personal Wellbeing Index (PWI) Quality of Life Survey (QLS)				X	•		Strong (16/20), II
Gal et al., 2015b, Israel	Pretest-posttest study	Individuals diagnosed with AS, ASD or PDD-NOS; N=25 (24 males, 1 female); Age: M=19.08	Quality of Life questionnaire (QOL-Q); Personal Wellbeing Index (PWI) Quality of Life Survey (QLS)	X				•	•	Adequate (15/22), II
Garcia-Villamisar et al., 2002, Spain	Quasi-experimental	Individuals diagnosed with ASD; N=55 Sheltered: n=26 (18 males, 8 females) Age: M=21.07 (4.18) Supported: n=25 (21 males, 4 females); Age: M=21.64 (3.75)	Quality of Life Survey (QLS)		X	X			•	Strong (19/22), III
Garcia-Villamisar and Hughes, 2007, Spain	Pretest-posttest study	Individuals diagnosed with ASD; Supported employment group: N=44 (32 males, 12 females); Age: M=25.52 (3.35) Control: sample not reported except for age: M=24.32 (4.34)	Cambridge Neuropsychological Tests: Automated Battery (CANTAB), Trail Making Test, Matching Familiar Figures Test, The Word Fluency Test				X		•	Strong (16/20), III
Gladh and Sjölund, 2014, Sweden	Pilot intervention evaluation	Individuals diagnosed with ASD	Self-assessment			X	X	•		Adequate (10/20), IV
Griffith et al., 2012, Wales	Semi-structured interviews	Individuals diagnosed with or self-reporting AS; N=11 (7 males, 4 females) Age: M=46.36 (7.17)	Interview question guide developed based on a literature review				X		•	Good (14/20), V

Table 2. Continued

Author, year, country	Design	Participants	Outcome measures	Type of employment				Employment stage		Quality and level of evidence		
				W/I /VT	S	SE	C	P	S		M	
Hagner and Cooney, 2005, USA	Semi-structured interviews	Supervisors of employees with autism; N=14, age and gender not reported	Interview question guide developed based on a literature review of employment support services				X		•	•	Adequate (11/20), V	
Hayward et al., 2018, Australia	Systematic review	Individuals with ASD; N=731 (n=229 females), Age: M=34.38 (7.71)	Effect sizes, outcomes and descriptive analysis				X		•	•	Adequate (13/20) IV	
Hedley, 2016, Australia	Systematic review	Individuals diagnosed with ASD; N= 58,134 Qual: n=59 (91% males, 9% females); Age: M=24.84 (5.93) Quant: n=717 (79% males, 21 females); Age: M=24.24 (4.32) Database: n= 57, 172 (80% males, 20% female); Age: M=27.46 (7.73) Mixed: n=186 (74% males, 26% females); Age: M=27.93 (6.54)	Coding for background information						•	•	•	Adequate (12/18), I
Hendricks, 2010, USA	Narrative literature review	Individuals diagnosed with ASD	N/A				X	X	•	•	•	Limited (8/20), V
Higgins et al., 2008, USA	Narrative literature review	Individuals diagnosed with AS	N/A				X			•	•	Limited (7/20), V
Holwerda et al., 2012, Netherlands	Systematic review	Individuals diagnosed with ASD; Gender and age not reported	Quality and methodological assessment		X	X	X				•	Good (14/18), I
Holwerda et al., 2013, Netherlands	Cross-sectional study	Individuals diagnosed with ASD; N=563 (401 males, 162 females); Age: M=19.4 (2.4)	Using a database description of employment predictive factors relating to: demographics, self-esteem, self-knowledge, motivation, work expectations, living situation, perceived support, attitudes of parents regarding work, attitudes of social environment				X			•	•	Good (14/20), III
Howlin, 2000, UK	Review of longitudinal follow-up studies	Individuals diagnosed with HFA; N=123 (18 years and older; 86% males, 14% females)	N/A		X	X	X				•	Limited (8/20), IV
Howlin et al., 2004, UK	Longitudinal follow-up study	Individuals diagnosed with ASD; N=68 (61 males, 7 females); Baseline age: M=7.24 (3.1) Follow-up age: M=29.33 (7.97)	Autism Diagnostic Interview (ADI)-social functioning, standardised interview schedules, parental questionnaire, Wechsler Adult Intelligence Scale-Revised (WAIS-R)		X	X	X				•	Strong (18/22), III

Table 2. Continued

Author, year, country	Design	Participants	Outcome measures	Type of employment				Employment stage		Quality and level of evidence	
				W/I /WT	S	SE	C	P	S		M
Howlin et al., 2005, UK	Longitudinal follow-up study	Individuals diagnosed with AS or ASD; Participants-n=114 (male: female ration 4.2:1); Age: M=31.4 (9.3) Line manager: n=63 Employers: n=61 Prospects program staff: n=15 Age and gender not reported	Descriptions of employment outcomes relating to: number and type of jobs, cost-benefit analysis Participants (individuals with ASD), line managers, employers and staff interviewed on Prospects program experience			X					Strong (16/20), III
Howlin and Moss, 2012, UK	Narrative literature review	Individuals diagnosis with AS, ASD or PDD-NOS; N=1561 (16-57 years); gender not reported	Adapted adult functioning rating adopted				X			•	Limited (9/20), IV
Hurlbutt, 2004, USA	Semi-structured interviews	Individuals diagnosed with AS; N=6 (25-65 years; 3 males, 3 females)	Interview question guide regarding employment experiences				X			•	Good (14/20), IV
Järbrink et al., 2007, Sweden	Structured interviews	Individuals diagnosed with ASD; N=19 (84% male); Age: M=29.6	Client Service Receipt Inventory			X	X			•	Adequate (10/20), III
Johnson and Joshi, 2016, USA	Two-part study: Study 1: semi-structured interviews Study 2: online survey	Individuals diagnosed with ASD; Study 1: N=30 (24-58 years, gender not reported) Study 2: N=210 (64% male, 36% female); Age: M=31 (11.4)	Study 1: Interview question guide regarding work-related responses to ASD diagnosis Study 2: Online survey relating to implications of an ASD diagnosis for workplace well-being				X			•	Strong (16/20), V
Katz et al., 2015, Israel	Follow-up study	Individuals diagnosed with HFASD; N=26 (24 males, 2 females); Age: M=29.1 (5.4)	Work Performance Evaluation (WPE), QOL-Q				X		•	•	Strong (17/20), II
Kaya et al., 2016, USA	Retrospective observational study using national database	Individuals diagnosed with ASD who were clients of VR services in the USA; N=4,332 (84.7% male, 15.3% female), Age: 16-25 years.	Using a database description of employment factors relating to: demographic factors and VR services provided.				X			•	Strong (20/20) III
Kaya et al., 2018, Turkey	Quantitative correlational design using national database	Individuals diagnosed with ASD who clients of VR services in the USA; N=3,243 (83.1% male, 16.9% female), Age: 19-25 years.	Using database description of factors relating to demographics, employment outcomes and VR services received.				X			•	Strong (20/20) III
Keel et al., 2015, USA	Retrospective cohort study	Individuals diagnosed with ASD or PDD-NOS; N=100; Age: M=25; gender not reported	Descriptions of employment outcomes relating to: type of job, hours worked per week, wages earned and job retention			X				•	Adequate (11/20), V
Krieger et al., 2012, Switzerland	Semi-structured interviews	Individuals diagnosed with AS; N=6 (30-45 years; 4 males, 2 females)	Thematic interview question guide relating to contextual factors impacting successful employment				X			•	Strong (20/22), V

Table 2. Continued

Author, year, country	Design	Participants	Outcome measures	Type of employment				Employment stage		Quality and level of evidence	
				W/I /VT	S	SE	C	P	S		M
Lattimore et al., 2002, USA	Multiple probe baseline study	Individuals diagnosed with ASD; N=3 (25-29 years, all male)	Prework assessment, number of preferred tasks selected			X			•	Limited (6/20), II	
Lattimore et al., 2003, USA	Multiple probe baseline study	Individuals diagnosed with ASD; N=5 (all male); Age: M=30	Prework assessment, on-the-job preference assessment			X			•	Adequate (12/20), II	
Lawer et al., 2009, USA	Routine data-based study, case-control design	Individuals diagnosed with ASD; N= 1707 (18-65 years, 84% males, 16 females)	Using a database description of employment outcomes relating to: access to services, cost of services, competitive employment			X			•	•	Strong (20/22), IV
Lopez and Keenan, 2014, UK	Online survey	Individuals diagnosed with ASD, carers, practitioners; Individuals with ASD: n=46 (31 males, 15 females); Age: M= 39.7 (13.1) Carers: n=36 (5 males, 31 females); Age: M=53.33 (10.67) Practitioners including therapists, clinicians, educators, support workers, advisors: n=38 (8 males, 30 females); Age: M=44 (11.26)	Questionnaires collecting data on demographics, employment history, training				X		•	•	Adequate (12/20), IV
Lorenz et al., 2016, Germany	Online survey	Individuals diagnosed with ASD; N=66 (29 males, 36 females, 1 other); Age: M=35.96 (10.22)	Qualitative questionnaire with 28 open-formatted questions including the General Self-Efficacy Scale, Occupational Self-efficacy, Satisfaction with Life Scale, job satisfaction using a Likert scale				X		•	•	Strong (16/20), III
Lugas et al., 2010, USA	Retrospective observational study	Individuals diagnosed with ASD; N=3323 (16-26 years, gender not reported)	Using a database description of employment outcomes relating to: services received, employment status				X		•	•	Adequate (11/20), III
Mank et al., 1997, USA	Correlation study	Individuals diagnosed with a disability including ASD; N=462, (18-50 years, 59.1% males, 40.9% females) (ASD n=10)	Survey relating to outcomes and features to supported employment including job title, hours worked, wages, benefits, accommodation, worksite characteristics, typicalness of employment situation				X			•	Strong (20/20), IV
Mavranouzouli et al., 2013, UK	Retrospective observational study	Individuals diagnosed with ASD without ID; N=50 (age and gender not reported)	Quality-Adjusted Life Year (QALY), description of cost data relating to: vocational rehabilitation services provided including potential accommodation savings and other NHS costs				X		•	•	Strong (17/18), IV
McDonough and Revell, 2010, USA	Narrative literature review	Individuals diagnosed with ASD; N=2 case studies (22-27 years, both male)	Situational assessments				X	X	•	•	Limited (9/20), IV

Table 2. Continued

Author, year, country	Design	Participants	Outcome measures	Type of employment				Employment stage		Quality and level of evidence	
				W/I /VT	S	SE	C	P	S		M
McMahon et al., 2012, USA	Cohort study with a control group	Individuals diagnosed with ASD and ID; ASD group: n=170 (77.6% males, 22.4% females); Age: M=33 ID group: n=1459 (65.3% males, 34.7% females); Age: M=36	Using a database description of workplace discrimination allegations relating to: profiles, low number of cases, age, gender, industry				X		•	•	Good (15/20), IV
Migliore et al., 2012a, USA	Retrospective observational study	Individuals diagnosed with ASD; N=6952 (16-26 years, gender not reported)	Using a database description of employment outcomes relating to: number of individuals receiving services, rehabilitation rate, wages per hour and work hours				X		•		Limited (9/20), III
Migliore et al., 2012b, USA	Retrospective observational study	Individuals diagnosed with ASD; N= 2913 (16-26 years, gender not reported)	Using a database description of transition outcomes and predictors relating to VR services received including gaining integrated employment, hourly earnings, weekly work hours and post-secondary education improvement				X		•		Strong (16/20), IV
Migliore et al., 2014, USA	Correlation study using a national database	Individuals diagnosed with ASD; N= 6952 (16-26 years, gender not reported)	Using a database description of employment outcomes relating to: number of youth existing VR services, receiving services, rehabilitation rates, earning and work hours			X	X			•	Strong (17/20), III
Morgan and Schultz, 2012, USA	Narrative literature review	Individuals diagnosed with ASD; N=1 case study (19-year-old male)	Job-task assessment, social network assessment			X	X		•	•	Adequate (10/20), IV
Müller et al., 2003, USA	Semi-structured interviews	Individuals diagnosed with AS or ASD; N=18 (18-62 years; 13 males, 5 females)	Interview protocol on strategies for improving vocational placement and job retention services				X		•	•	Adequate (12/20), V
Müller and Vangilder, 2014, USA	Follow-up study	Individuals diagnosed with a disability including ASD; N=10 (17-24 years; 6 males, 4 females); ASD n=4	Developed a Job Readiness Assessment Tool (JRAT), 3 brief interview protocols regarding perceptions of participants' growth and ongoing challenges in the study				X		•		Good (17/22), II
Nesbitt, 2000, UK	Cross-sectional questionnaire	Organisations employing adults with AS; N=69; no age or gender reported	Developed questionnaire according to support needs and employment process			X			•		Adequate (12/20), III
Nicholas et al., 2014, Canada	Narrative literature review	Individuals diagnosed with AS; 18 years and older	N/A			X	X		•	•	Strong (20/20), IV

Table 2. Continued

Author, year, country	Design	Participants	Outcome measures	Type of employment				Employment stage		Quality and level of evidence	
				W/I /VT	S	SE	C	P	S		M
Nicholas et al., 2017a, Canada	Qualitative analytic Focus groups	Individuals with ASD, family members, researchers, program and policy developers, practitioners, and interdisciplinary ASD trainees; N=120	Qualitative description analysis	X		X	X	•	•	•	Strong (16/20) V
Nicholas et al., 2017b, Canada	Mixed methods	Survey: senior clinicians and administrators of employment support programs; N=137 Qualitative interviews: Individuals with ASD, AS or PDD-NOS; N=71 (69% male, 31% female), Age range 18-65 years Parents/caregivers.; N=51	Survey: Likert scale responses relating to capacity to meet vocational needs, enhancing systems capacity, service planning and evaluation and community capacity Qualitative interviews: line by line coding and thematic analysis.				X	•	•	•	Strong (20/22) III
Nord et al., 2016, USA	Retrospective observational study	Individuals with and without ASD; ASD group: n=977; Age: M=33.94 (12.36) Without ASD group: n=7992; Age: M=41.42 (11.4) gender not reported	Using a dataset description of employment outcomes relating to community employment, diagnosis, age, behaviour, health, mobility				X		•	•	Strong (22/22), III
Nye-Lengerman, 2017, USA	Retrospective observational study using national database	Individuals diagnosed with ASD who were clients of VR services in the USA; N=10,209 (83.6% male, 16.4% female), Age: M=21.57 (SD: 7.13) years	Using a database description of employment factors relating to: demographic factors and VR services provided.				X		•		Strong (20/22) III
Ohl et al., 2017, USA	Cross-sectional survey	Individuals with AS; N=254 (55.12% males, 43.31% female), Age: M= 38.11 (SD: 13.02) years Employed subgroup; n=156 (59.48% male, 40.52% female), Age: M=38.87 (SD:12.97) years Unemployed subgroup: n=98 (50.52% male, 49.48% female), Age: M=36.93 (SD: 13.07) years	ASD Employment Questionnaire (ASDEQ), Short Effort-Reward Imbalance Questionnaire (ERI)				X		•	•	Strong (22/22) III

Table 2. Continued

Author, year, country	Design	Participants	Outcome measures	Type of employment				Employment stage		Quality and level of evidence	
				W/I /VT	S	SE	C	P	S		M
Parr and Hunter, 2013, USA	Semi-structured interviews	Individuals diagnosed with ASD; N=54 (46.3% males, 53.7% females)	Interview question guide, five-point Likert scale of leadership behaviours work outcomes measured using 7-point Likert scales, 3-items from Michigan Organizational Assessment Questionnaire, organisational commitment using 8-items from the Affective Commitment Scale, work engagement using 6-items from Utrecht Work Engagement Scale Quality Appraisal Checklist				X		•	•	Good (20/26), V
Pillay and Brownlow, 2016, Australia	Systematic review	Individuals diagnosed with ASD; N= 3984 (16-55 years)					X		•	•	Strong (18/20), I
Rashid et al., 2017, Canada	Synthesis review	Individuals with developmental disability, including ASD	Content analysis			X	X		•	•	Strong (18/20) II
Richards, 2012, UK	Qualitative database study	Individuals diagnosed with AS; Age and gender not specified	Using the database descriptions of exclusion processes relating to selection procedures, people management, physical and social environment, employer resistance to accommodations				X			•	Adequate (12/20), V
Rosqvist and Keisu, 2012, Sweden	Qualitative review	Individuals diagnosed with ASD; Sample size, gender and age not reported	Thematic coding de-constructing the notion of 'real jobs'				X		•	•	Limited (9/20), V
Roux et al., 2013, USA	Cross-sectional survey national database prospective longitudinal study	Individuals diagnosed with ASD; N=620 (85% males); Age: M=23.2	Using the database description of employment outcomes relating to: employment status, job type, number of jobs since high school and wages earned, functional skills 4-point Likert scale				X			•	Strong (20/22), III
Roux et al., 2015, USA	Cross-sectional survey national database prospective longitudinal study	Individuals diagnosed with ASD; 21-25 years; 80% males	National Longitudinal Transition Study-2 questionnaire relating to adult outcomes, health, post-secondary education, employment, living arrangements, social and community participation and safety and risk			X	X		•	•	Limited (9/24), N/A
Schall et al., 2015, USA	Retrospective observational records review	Individuals diagnosed with ASD; N=45 Project Search group: n=25 (18 males, 7 females); Age: M=23.12 (1.13) SE group: n=20 (19 males, 1 females); M=29.05 (10.95)	Individual employment records relating to intake, hourly billing, employment notes, employment outcomes, number of intervention hours, time in job, wages earned				X			•	Strong (18/20), III

Table 2. Continued

Author, year, country	Design	Participants	Outcome measures	Type of employment				Employment stage		Quality and level of evidence		
				W/I /VT	S	SE	C	P	S		M	
Schaller and Yang, 2005, USA	Correlation study using a national database	Individuals diagnosed with ASD; C: n=450 (84.2% males); Age: M= 25.3 (7.69) SE: n=365 (87.9% males); Age: M= 27.3 (7.23)	Using a database description of employment outcomes relating to: successful or unsuccessful close of VR support plan, case service cost, hours worked per week and weekly wages earned				X			•	Strong (20/20), III	
Scott et al., 2015, Australia	Q sort method	Individuals diagnosed with ASD and their employers; ASD: n=40 (24 males, 16 females); Age: M= 29.1 (10.7) Employers: n=35 (16 males, 19 females); Age: M=44.6 (10.4)	Q sort pack including concourse statements developed from the literature and Q sort grid				X	•	•	•	Strong (20/20), III	
Seaman and Cannella-Malone, 2016, USA	Narrative Literature review	Individuals diagnosed with ASD; N=203 (13-60 years; 178 males, 25 females)	Quality and methodological assessment of evidence	X						•	Strong (17/20), V	
Shattuck et al., 2012, USA	Correlational study using national database prospective longitudinal study	Individuals diagnosed with ASD; ASD: n=680 (19-23 years; 86.9% males, 13.1% females)	Questionnaire relating to participation in postsecondary education and paid employment, length of time in high school, health, functional independence skills				X			•	•	Strong (18/20), III
Shattuck et al., 2015, USA	Narrative literature review	Individuals diagnosed with ASD; N=14,392 (18-65 years; 83% males)	N/A				X			•	•	Strong (20/20), V
Smith et al., 2015, USA	Follow-up survey	Individuals diagnosed with HFASD; N=23 VR-JIT: n=15 (73.3% males); Age: M=25 (6.9) Control: n=8 (75% males); Age: M=23.1 (3.3)	Bell-Lysaker Emotion Recognition Task (BLERT), Social Responsiveness Scale (SRS), self-confidence 7-point Likert scale, process measures including: change in job role-play performance, number of virtual VR-JIT trials completed and changes in VR-JIT performance across trials				X			•		Strong (18/20), V
Smith et al., 2017, USA	Systematic review	Individuals with disabilities, including ASD	Level of evidence, risk bias	X	X	X	X	•	•	•		Strong (19/20), I
Stuckey, 2016, USA	Online survey	Business executives in a hiring role; N=157 (97 males, 54 females, 6 other); age not reported	Online 14-item survey on knowledge of ASD				X			•	•	Strong (18/18), IV

Table 2. Continued

Author, year, country	Design	Participants	Outcome measures	Type of employment				Employment stage		Quality and level of evidence	
				W/I /VT	S	SE	C	P	S		M
Sung et al., 2015, USA	Case report database analysis	Individuals diagnosed with ASD; N=1696 (16-25 years; 857 males, 839 females)	Using a database description of employment outcomes relating to employment status at VR case closure, predictors including demographic characteristics, work incentives and VR services				X		•	•	Strong (20/20), IV
Taylor and Seltzer, 2011, USA	Cross-sectional subsample from a prospective longitudinal study	Individuals diagnosed with ASD; N=66 (80% males); Age: M=22.98 (1.51)	Adult day activities, Wide Range Intelligence Test, family income, ADI-Revised (ADI-R), Scales of Independent Behaviours-Revised (SIB-R) completed by mothers, revised Activities of daily living (ADL) Index		X	X	X		•		Strong (20/20), IV
Taylor et al., 2012a, USA	Systematic review	Individuals diagnosed with ASD; 13-30 years, gender not reported	Quality and methodological assessment of evidence				X		•	•	Strong (18/20), I
Taylor and Seltzer, 2012b, USA	Cross-sectional subsample from a prospective longitudinal study	Individuals diagnosed with ASD N=343 (73% males); Age: M=22.84 (9.58)	Descriptive profiling including: weekly participation in vocational or educational activities, numbers of hours of participation, job history	X	X	X	X		•	•	Strong (17/18), III
Taylor, 2014, USA	Longitudinal follow-up study	Individuals diagnosed with AS, ASD, or PDD-NOS; N=161 (72% males); Age: M=30.9 (8.3)	The Vocational Index, parents completed Behaviour Problems subscale of the SIB-R, ADI-R, residential status, demographic characteristics			X			•	•	Strong (19/20), III
Taylor et al., 2015, USA	Longitudinal correlational study	Individuals diagnosed with ASD; N=73 (79.5% males); Age: M=23.83 (6.83)	The Vocational Index, demographic characteristics, behavioural indices from Time 1 in longitudinal study, Waisman ADL Scale (W-ADL), subscale of the SIB-R, ADI-R, family indices including mother's support network, maternal depressive symptoms				X		•	•	Strong (18/18), III
Van Wieren et al., 2008, USA	Cohort study with a control group	Individuals diagnosed with ASD and other disabilities including physical, sensory or neurological; ASD group: n= 98 (72 males, 26 females); Age: M= 36 Disability group: n=174,330 (54.7% males, 45.3% females); Age: M=44	Description of demographic characteristics, industry type, number and type of allegations				X		•	•	Strong (19/20), IV

Table 2. Continued

Author, year, country	Design	Participants	Outcome measures	Type of employment				Employment stage		Quality and level of evidence	
				W/I /VT	S	SE	C	P	S		M
Vogeley et al., 2013, Germany	Narrative literature review	Individuals diagnosed with HFASD; Sample, gender and age not reported	N/A			X			•	•	Limited (0/20), V
Walsh and Hall, 2012, UK	Critical review report	Individuals diagnosed with ASD; Sample size, gender and age not reported	Descriptively critiqued equity, integration, implementation and diagnosis and specialist interventions services for individuals with ASD			X	X		•	•	Limited (0/20), V
Walsh et al., 2014, Ireland	Narrative literature review	Individuals diagnosed with AS, ASD or PDD-NOS; N=78 (13-30 years; 72.2% males)	N/A				X		•	•	Strong (18/20), V
Wehman et al., 2014, USA	Narrative literature review	Individuals diagnosed with ASD; Sample size, gender and age not reported	N/A				X		•	•	Limited (2/20), V
Wehman et al., 2016a, USA	Retrospective records review	Individuals diagnosed with ASD; N=64 (52 males, 12 females); Age: M=26	Description of employment outcomes relating to: employment rate, job type, wages and benefits earned, weekly work hours, supports used, intervention time				X		•	•	Strong (16/18), V
Wei et al., 2015, USA	Cross-sectional subsample from a prospective longitudinal study	Individuals diagnosed with ASD; N=120 (15-18 years; 86.6% males)	Six survey items, parents answered employment-related questions and demographic characteristics				X		•	•	Strong (16/18), III
Westbrook et al., 2012, USA	Systematic review	Individuals diagnosed with ASD; N=101 gender and age not specifically reported	Quality and methodological assessment of evidence				X		•	•	Strong (18/20), II
Whetzel, 2014, USA	Narrative literature review	Individuals diagnosed with ASD; Sample size, gender and age not reported	N/A				X		•		Limited (0/20), V
Wilczynski et al., 2013, USA	Narrative literature review	Individuals diagnosed with ASD;	N/A				X		•	•	Limited (0/20), V

Note. W/I/VT: Work experience or internship or vocational training; S: Sheltered employment; SE: Supported employment; C: Competitive employment

P: Preparing for employment; S: Seeking or securing employment; M: Maintaining employment

ASD: Autism spectrum disorder; AS: Asperger's syndrome; HFASD: High functioning ASD; PDD-NOS: Pervasive developmental disorder not-otherwise specified, according to the DSM-IV (American Psychiatric Association, 2000); ID: intellectual disability

M: Mean; *Mdn*: Median; Qual: Qualitative; Quant: Quantitative

ADL: Activities of Daily Living; NHS: National Health Services; VR: Vocational Rehabilitation; VR-JIT: Virtual reality job interview training

TERA: Test of Early Reading Ability; AWSQ: Autism Work Skills Questionnaire; QOL-Q: Quality of Life Questionnaire; PWI: Personal Well-being Index; QLS: Quality of Life Survey; CANTAB: Cambridge Neuropsychological Tests

Automated Battery (CANTAB); ADI-R: Autism Diagnostic Interview Revised; WAIS-R: Wechsler Adult Intelligence Scale Revised; WPE: Work Performance Evaluation; QALY: Quality Adjusted Life Year; JRAT: Job Readiness Assessment Tool; BLERT: Bell-Lysaker Emotion Recognition Test; SRS: Social Responsiveness Scale; SIB-R: Scales of Independent Behaviour Revised;

W-ADL: Waisman Activities of Daily Living Scale

relation to factors predicting outcomes (Holwerda et al., 2012; Howlin et al., 2004; Bush and Tassé, 2017) including, supports and services required (Autism Europe, 2014; Gladh and Sjölund, 2014; Hendricks, 2010; McDonough and Revell, 2010; Morgan and Schultz, 2012; Nicholas et al., 2014; Roux et al., 2015; Taylor and Seltzer, 2011; Taylor and Seltzer, 2012; Walsh and Hall, 2012; Rashid et al., 2017; Smith et al., 2017; Nicholas et al., 2017a), the associated costs of ongoing support employment services (Järbrink et al., 2007; Migliore et al., 2014; Cimera and Cowan, 2009), and quality of life outcomes (Garcia-Villamizar et al., 2002). Articles were reviewed for the stage of employment, including job preparation, job acquirement and job retention. While job termination is an important aspect of the employment process, it did not feature in the published research, other than a few papers addressing it as a discussion point. Articles predominantly focused on securing and maintaining a job, with less consideration for job preparation, an aspect more likely to be addressed in the transition literature, which was outside the scope of this review.

Outcome measures

Overall, measures utilised in the employment outcomes studies were primarily characterised as descriptive and observational, with several studies developing their own outcome tools (Howlin and Moss, 2012; Lorenz et al., 2016; Müller and Vangilder, 2014; Ohl et al., 2017). Outcomes were reported according to job type, hours worked, wages earned, and support services required, and were supplemented by employee self-reports and anecdotal employer accounts of job performance. The few studies employing standardised measures ($k=16$) utilised published measures to corroborate and standardise ASD diagnosis (e.g., Autism Diagnostic Interview-Revised), general intellectual abilities (e.g., Wechsler Adult Intelligence Scales), autistic trait severity (Social Responsiveness Scale version 2) and adaptive behaviour (Scales of Independent Behaviour-Revised). Four articles utilised standardised employment-related measures, including the Autism Work Skills Questionnaire (AWSQ) (Gal et al., 2015a), the Vocational Index (Taylor and Seltzer, 2012),

the Work Performance Evaluation (WPE) (Katz et al., 2015) and one study examining perceived effort-reward balance at work using the Short Effort Reward Imbalance Questionnaire (ERI) (Ohl et al., 2017). Only three studies explored the impact of employment on quality of life (Gal et al., 2015b; Garcia-Villamizar et al., 2002; Katz et al., 2015).

Content analysis of ASD-related abilities contributing to employment

A sub-group of articles relating to employment outcomes were identified as recognising the skills and abilities that individuals with ASD bring to the workplace. According to the ICF, these specific ASD-related skills and abilities are considered *personal factors*. While personal factors are not classified within the ICF due to their unique and varying characteristics, their contribution to an individual's disability and functioning may impact on the outcomes of an intervention (World Health Organization, 2001). Given ASD-related skills and abilities could not be linked to the ICF, content analysis was employed to identify the skills and abilities of individuals with ASD contributing to successful employment by examining and coding the results sections only of articles according to the ASD-related ability categories, as described by de Schipper et al. (de Schipper et al., 2016). In total, 14 studies described results which aligned either with the previously described strengths of participants with ASD (de Schipper et al., 2016), or with additional skills and abilities in relation to punctuality, low absenteeism, high quality of work, prompt task commencement and strong work ethic, included in the category of 'other' (Table 3).

Table 3. Article contribution to ASD-related skills and abilities in employment

Author and year	ASD-related skills and abilities ^a														
	Attention to detail	Other	Strong sense of morality	Intellectual functions	Technical abilities	Trustworthiness	Repetitive or monotonous tasks	Artistic skills	Visual perception	Good memory	Expertise in a specific area	Creative talents	Loyalty	Mathematical abilities	Kindness
Baldwin et al., 2014					•		•								
Briel and Getzel, 2014						•	•	•			•				
Burt et al., 1991								•							
Gal et al., 2015a	•	•					•								
Garcia-Villamizar and Hughes, 2007				•						•					
Hagner and Cooney, 2005	•	•				•				•					
Ham, 2014	•						•			•		•			
Hillier, 2007	•	•	•		•	•					•		•		
Holwerda et al., 2012				•											
Mawhood and Howlin, 1999	•	•	•												
Müller et al., 2003	•	•			•			•		•			•		
Müller and Vangilder, 2014	•	•	•		•	•	•						•		•
Stuckey, 2016	•	•	•	•											
Wehman et al., 2013				•			•								

^aASD-related skills and abilities list taken from de Schipper et al. (de Schipper et al., 2016)

Articles evaluating employment programs and interventions (k=36)

A total of 36 articles describing and evaluating employment programs and interventions for individuals with ASD were included in the linking process. Articles comprised of a total of 556 participants, with a mean age of 23.6 (SD=6.4) years, of which 84% were male. Table 4 summarises the descriptive characteristics of the selected employment program and intervention studies (k=36).

Quality assessment of studies and levels of evidence

The level of evidence of research evaluating employment programs and interventions was rated according to the Joanna Briggs Institute hierarchy of scientific evidence for meaningfulness, from level I (experimental designs) through to level V (expert opinion and bench research), with the majority of articles rated as level II evidence (quasi-experimental designs) (k=21) (The Joanna Briggs Institute, 2014). Many articles either described or evaluated the effectiveness of an employment program or intervention with common study designs including multiple-baseline (k=12), case studies (k=8), randomised controlled trials (k=7), cohorts (k=3), pretest-posttests (k=4) and case-control (k=2) (Table 4).

The methodological quality of program and intervention studies ranged from limited (k=8); adequate (k=12); good (k=3) and strong (k=13) (Kmet et al., 2004; Lee et al., 2008).

Limitations included small sample sizes, a lack of employment outcome measures resulting in a reliance on employee self-report and anecdotal employer accounts on job performance in the workplace, costly implementation of technology-based interventions, and poor translation of interventions and programs into actual employment contexts.

Employment programs and interventions

Studies included in this review targeted the various stages of the employment process including preparing, finding and securing and maintaining employment (Table 4). Of the included studies, 13 focused on employment preparation using video modelling, role playing or group training in teaching the necessary social, communication and vocational

skills commonly utilised in acquiring a job. One study primarily focused on gaining employment through Individual Placement Support (McLaren et al., 2017) and eight studies focused on maintaining a job, primarily employing behavioural and task management strategies delivered through technology, simulation training or job coaches. The remaining 14 studies addressed two or more stages of the employment process, with programs and interventions initially targeting one stage and their respective outcomes targeting another, such as role play used in teaching the appropriate social-communication skills in preparing for a job interview, that when implemented resulted in successfully securing a job (Smith et al., 2014; Strickland et al., 2013). Comparison groups varied. A pre-post study evaluated a manual-based workplace intervention compared to a no treatment group of typically developing adults (Bonete et al., 2015). The Personal Digital Assistant intervention used a delayed RCT, with the control group receiving PDAs 12-weeks after beginning job placement (Gentry et al., 2015). An interview skills group RCT used waitlist control (Morgan et al., 2014).

Table 4. Descriptive characteristics of employment program and intervention studies ($k=36$) linked to the ICF

Reference	Design	Participants	Outcome measures	Intervention results	Type of employment	Employment stage	Quality and level of evidence	ICF category codes ^{a,b}
Allen et al., 2010a	Multiple baseline across participants	Individuals diagnosed with AS or PDD-NOS; N=3 (17-22 years, all male)	Observation of vocational skill acquisition; partial interval recording system	<u>Vocational skills</u> A 30% increase in acquisition and retention of targeted vocational skills post VM	W/I/VT	P	Adequate (11/22), II	Second level: b117, b122, b130, b760, d160, d220, d825, e125, e130 Third level: b1300, b1301, b1304, b7600, b7601, b7602, d2200, d2201, d2202, d2204, d8250, d8251, e1250, e1300
Allen et al., 2010b	Multiple baseline across participants	Individuals diagnosed with AS, ASD or PDD-NOS; N=4 (16-25 years, all male)	Observation of vocational skill acquisition; partial interval recording system	<u>Vocational skills</u> Participants learned to use targeted skills after watching VM	W/I/VT	P	Adequate (11/22), II	Second level: b117, b122, b130, b760, d160, d220, d825, d850, e125, e130 Third level: b1300, b1301, b1304, b7600, b7601, b7602, d2200, d2201, d2202, d2204, d8250, d8251, e1250, e1300
Arikawa et al., 2013	Case study	Individual diagnosed with AS; N=2, (n=1,30-year-old male)	On-the-job occupational therapy task analysis assessment (unspecified)	<u>Executive functioning skills</u> Problem-solving, planning, predicting, attention and concentration skills improved following on-the-job training and workplace modifications delivered by an occupational therapist	W/I/VT	P	Limited (9/20), IV	Second level: b117, b760, d155, d160, d175, d250 d845, e360, e590 Third level: b7600, d1550, d1601, d1750, d1751, d2500, d2504, d8451, e5900

Table 4. Continued.

Reference	Design	Participants	Outcome measures	Intervention results	Type of employment	Employment stage	Quality and level of evidence	ICF category codes ^{a,b}
Baker-Ericzen et al., 2017	Pilot study Pretest-posttest	Individuals with ASD; N=8 (78% male), Age: <i>M</i> =22.44 (3.55) years	Delis-Kaplan Executive Functioning System (D-KEFS), Behavior Rating Inventory of Executive Function – Adult (BRIEF-A), SRS-2, Social Skills Performance Assessment (SSPA), Functional Daily Living Questionnaire, Employment Interview, Participant Satisfaction Questionnaire	Executive functioning skills Increased participant reported BRIEF-A global composite scores ($p=0.018$), task monitoring, self-monitoring and planning/organizing ($p<0.05$). Improved D-KEF performance in sorting, deductive reasoning and planning ($p<0.05$). Vocational skills Participant reported improvement in social awareness and social motivation ($p<0.05$) scores on SRS-2. Increase in SSPA scores for ‘chat with co-worker’ and ‘request time off’ items ($p <0.05$) No significant change in daily living not related to work. Significant improvement in scheduling appointments item ($p=0.02$). Employment status 34% increase in paid employment at posttest ($p=0.18$). Salaries at posttest ranged from US\$10 – US\$18.	W/I/VT	P, S	Strong (19/20) II	Second level: b122, b140, b152, b164, d175, d220, d250, d310, d315, d330, d350, d570, d710, d720, d750, d845, e325, e330, e360 Third level: b1400, b1520, b1521, b1643, d1750, d1751, d2200, d2201, d2203, d3150, d3500, d3501, d3502, d3503, d3504, d5708, d7104, d7200, d7202, d7203, d7208, d7509, d8451 Fourth level: d71040, d71041
Bennet et al., 2010	Multiple baseline across participants	Individual diagnosed with ASD; N=3 ($n=1$, 22-year-old male)	Job Observation and Behaviour Scale (JOBS); normative data for accuracy and rate of task performance and feedback	Vocational skills Substantial improvements in work performance, maintained for 4-5 weeks following removal of the intervention	SE	M	Adequate (11/22), II	Second level: b117, b122, b156, d155, d220, d845, e130, e360, e590 Third level: b1560, d1550, d1551, d2200, d2201, d2202, d8451, e1300, e1301, e5900
Bonete et al., 2015	Pretest-posttest	Individuals diagnosed with AS; N=50 (43 males, 7 females); Age: <i>M</i> =19.54 (3.46)	Evaluación de Solución de Conflictos Interpersonales (ESCI); Osnabrück Ability to Work Profile (O-AFP); Vineland Adaptive Behaviour Scales– Second Edition (VABS-II)	Vocational skills Significantly higher social problem-solving ($p<0.001$) and socialisation skills ($p<0.001$) post-treatment. Differences in comparison to the control group decreased post-treatment. Treatment was acceptable to families and participant adherence was high	W/I/VT	P	Strong (20/22), II	Second level: b117, b122, d155, d175, d310, d315, d330, d350, d710, d720, e325, e360 Third level: d1551, d1750, d1751, d3100, d3101, 3102, d3150, d3500, d3501, d3502, d3503, d3504, d7100, d7101, d7102, d7103, d7104, d7106, Fourth level: d71040, d71041

Table 4. Continued.

Reference	Design	Participants	Outcome measures	Intervention results	Type of employment	Employment stage	Quality and level of evidence	ICF category codes ^{a,b}
Burke, 2010	Multiple baseline across participants	Individuals diagnosed with AS, ASD or PDD-NOS; N=6 (18-27 years, all male)	Observation of target behaviours, recorded response of script prompt	<u>Vocational skills</u> Five out of six participants achieved criterion behaviour skills following the introduction of the cue system in addition to behavioural skills training <u>Executive functioning skills</u> The sixth reached criterion with behavioural skills training alone	W/I/VT	P	Adequate (11/22), II	Second level: b117, b122, b130, b760, d155, d160, d220, d250, d825, e125, e130 Third level: b1300, b1301, b1304, b7600, b7601, b7602, d1550, d1551, d2200, d2201, d2202, d2204, d2501, d2502, d2504, d8250, d8251, e1250, e1300
Burke et al., 2013	Multiple baseline across participants	Individuals diagnosed with AS, ASD or PDD-NOS; N=4 (19-28 years, all male)	Descriptions of task analysis (73-steps required to complete tasks); recorded task steps correctly completed; home time logs of video viewed; Universal Design Performance Measure for Productivity (UDPMP)	<u>Vocational skills</u> VM and prompting were effective with marked improvement in on-the-job performance of multi-step shipping tasks	W/I/VT	P	Adequate (11/22), II	Second level: b117, b122, b140, d155, d160, d175, d220, d825, e125, e130 Third level: b1400, b1401, b1402, d1550, d1551, d1750, d1751, d2200, d2201, d2202, d8250, d8251, e1250, e1300
Burt et al., 1991	Case study	Individuals diagnosed with ASD and ID; N=4 (21-29 years; 3 males, 1 female)	Autism Behaviour Checklist; description of employment outcomes	<u>Employment status</u> Competitive employment gained and retained between 6-30 months following an intensive training program	C	P	Limited (5/20), IV	Second level: b117, b122, d155, d175, d250, d310, d315, d330, d350, d710, d720, d845, e360, e330 Third level: d1550, d1551, d2500, d2501, d2502, d2503, d2504, d3100, d3101, d3102, d3150, d3500, d3501, d3502, d3503, d3504, d7100, d7101, d7102, d7103, d7104, d7106, d7200, d7202, d7203, d7204, d8450, d8451 Fourth level: d71040, d71041
Dotson et al., 2013	Multiple baseline across participants	Individuals diagnosed with AS, ASD or PDD-NOS; N=8 (n=5, 19-30 years; 2 males, 3 females)	The Scales of Independent Behaviour-Revised (SIB-R); description of the percentage of job steps performed correctly and without prompts	<u>Vocational skills</u> Improved job skills performance following teaching and working shifts in a natural work environment independently or alongside a peer. Teaching procedures resulted in job skill acquisition for worker, supervisor, and office staff	W/I/VT	P, M	Adequate (12/20), II	Second level: b117, b122, d155, d175, d220, d250, d310, d315, d330, d350, d825, d845, e325, e360 Third level: d1550, d1551, d1750, d2203, d2501, d2503, d2504, d3100, d3101, d3102, d3150, d3503, d8451

Table 4. Continued

Reference	Design	Participants	Outcome measures	Intervention results	Type of employment	Employment stage	Quality and level of evidence	ICF category codes ^{a,b}
Gentry et al., 2012	Case study	Individuals diagnosed with ASD; N=3 (20-60 years; 1 male, 2 females)	Self-report; description of the hours of supervision and workplace training and support	<u>Executive functioning skills</u> Improved task management, organisational skills and self-regulated behaviours using the PDA	C	M	Limited (9/20), IV	Second level: b140, b164, d230, d250, d845, e125, e130, e360, e590 Third level: b1400, b1641, b1642, d2300, d2301, d2305, d2306, d2501, d2503, d2504, d8451, e1251, e1301, e5900
Gentry et al., 2015	Delayed randomised controlled trial (RCT)	Individuals diagnosed with ASD; N=50 (42 males, 8 females); Age: M=24.0 (8.3)	Craig Handicap Assessment and Rating Technique (CHART); Supports Intensity Scale-Employment Subscale (SIS-EPS); Employee Performance Evaluation Report (EPER); description of the hours worked and job coach hours	<u>Vocational skills</u> Experimental group receiving PDA training to assist in task organisation required significantly less hours of job coaching support (p = 0.013) than the control group	C	M	Strong (20/24), II	Second level: b140, b164, d230, d250, d310, d330, d350, d845, e125, e130, e360, e590 Third level: b1400, b1641, b1642, d2300, d2301, d2305, d2306, d2501, d2503, d2504, d8451, d3100, d3101, d3103, d3503, d8451, e1251, e1301, e5900
Gilson and Carter, 2016	Multiple-probe, single-case experimental	Individuals diagnosed with ASD; N=3 (n=2, 18-26 years, both male)	Description of partial interval recording system on social and task-related interactions, job coach hours, methods and type of coaching delivered	<u>Vocational skills</u> Increased social interactions and task engagement when job coaches reduced proximity and delivered prompts using bug-in-ear devices. Effects maintained post-intervention	W/I/VT	P	Adequate (13/20), II	Second level: b122, b156, b164, d220, d350, d710, d840, e125, e130, e360 Third level: b1560, b1641, d2200, d2201, d3504, d7103, d7104, e1251, e1301 Fourth level: d71040, d71041
Ham, 2014	Case study	Individuals diagnosed with ASD; N=2 (1 female age not reported, 1 23-year-old male)	Indirect and direct behaviour observation, anecdotal reports, description of the level of job coach support	<u>Employment status</u> Intensive job coaching assisted in job retention with fading supports for two or more years <u>Executive functioning skills</u> Improved self-regulated behaviour and task organisation skills	SE	S, M	Adequate (10/20), IV	Second level: b164, d250, d845, e325, e330, e360 Third level: b1641, b1642, d2501, d2502, d2503, d2504, d8451

Table 4. Continued

Reference	Design	Participants	Outcome measures	Intervention results	Type of employment	Employment stage	Quality and level of evidence	ICF category codes ^{a,b}
Hayes et al., 2015	RCT	Individuals diagnosed with ASD; N=15 (17-18 years; 13 males, 2 females)	VidCoach usage log, self-report on experience, interview performance rating scale (developed for the study)	<p><u>Vocational skills</u> Experimental group demonstrated significant improvement in interview performance (p<0.001) and in hygiene and health care (p=0.02)</p> <p><u>Executive functioning skills</u> Experimental group displayed significantly reduced fidgeting (p=0.022), improved skills in presenting ideas logically and succinctly (p=0.009). Control group displayed significant improvement in grammar and vocabulary usage (p<0.001)</p>	W/I//VT	P	Limited (11/26), II	<p>Second level: b117, b122, b140, d155, d220, d310, d315, d330, d350, d710, d825, d845, e125, e130</p> <p>Third level: b1400, b1401, 1558, d2209, d3100, d3101, d3102, d3150, d3508, d7108, e1251, e1301</p>
Hill et al., 2013	Case study	Individuals diagnosed with ASD; N=3 (23-26 years; 1 male, 2 females)	Self-report	<p><u>Employment status</u> Use of iPad device and support strategies culminated in increased independence, job placement and job retention.</p>	SE	S, M	Limited (9/20), IV	<p>Second level: b122, b140, b164, d250, d710, d845, e125, e130, e360</p> <p>Third level: b1400, b1401, b1641, b1642, d2501, d2503, d2504, d7108, d8451, e1251, e1301</p>
Hillier, 2007	Observational cohort study without a control group	Individuals diagnosed with ASD; N=9 (18-36 years; 8 males, 1 female)	Assessment Worksheet, Socialisation Scale, Job Satisfaction Index, Program Satisfaction Measures (all designed for the study), case notes	<p><u>Employment status</u> 78% increase in employment rates; wage ranged between US \$5.15-\$8.99 per hour, hours worked ranged between 4-40 per week. Average job retention of 12.5 months</p>	C	P, S, M	Good (14/20), II	<p>Second level: b117, d220, d250, d310, d330, d350, d710, d720, d845, e360</p> <p>Third level: d2204, d2503, d2504, d3100, d3101, d3102, d3508, d7203 d8450, d8451</p>
Kellems and Morningstar, 2012	Multiple-probe baseline across participants	Individuals diagnosed with AS or ASD; N=4 (20-22 years; all male)	Percentage of independent task steps completed correctly	<p><u>Vocational skills</u> Functional relation found between VM using iPods and increase in the percentage of work tasks steps correctly completed. All participants maintained performance on first two vocational skills for up to 30 days</p>	SE	M	Adequate (11/20), II	<p>Second level: b122, b140, b164, d155, d160, d220, d845, e130</p> <p>Third level: b1400, b1641, d1558, d1608, d2200, d8451, e1308</p>

Table 4. Continued

Reference	Design	Participants	Outcome measures	Intervention results	Type of employment	Employment stage	Quality and level of evidence	ICF category codes ^{a,b}
Lattimore, 2006	Multiple-probe baseline across participants	Individuals diagnosed with ASD and ID; N=3 (30-42 years; all male)	Percentage of independent task steps completed correctly for job-site training and simulation training	<u>Vocational skills</u> Acquisition of work-related skills increased with both job-site and simulation training compared to job-site training only, 88% of tasks completed independently; effects maintained post intervention	SE	M	Adequate (11/22), II	Second level: b117, b122, d155, d220, d845, d859, e360, e585, e590 Third level: d1558, d2200, d8450, e5850, e5900
Lattimore, 2008	Multiple-probe baseline across participants	Individuals diagnosed with ASD and ID; N=4 (29-32 years; all male)	Percentage of job task steps completed independently	<u>Vocational skills</u> Acquisition of work-related skills in simulation training improved independent job performance; skills maintained 1-31 weeks post intervention	SE	M	Adequate (12/22), II	Second level: b117, b122, d155, d220, d845, d859, e360, e585, e590 Third level: d1558, d2200, d8450, e5850, e5900
Liu et al., 2013	Pretest-posttest	Individuals diagnosed with ASD and ID; N=14 (10 males, 4 females); Age: M=24.6 (10.04)	Work Personality Profile (WPP), SIB-R, Observational Emotional Inventory Revised (OEI-R)	<u>Vocational skills</u> Improved workplace social behaviours in WPP (p=0.08); significant differences in workplace social communication in SIB-R (p=0.02) <u>Executive functioning skills</u> Significant difference in emotional response to socialisation in the workplace, better concept of self (p=0.04); limited generalised emotional behavioural control	C	P, M	Strong (17/20), II	Second level: b117, b122, b152, d155, d220, d310, d315, d330, d335, d349, d350, d710, d720, e398, e590 Third level: b1521, d2200, d3102, d3150, d3500, d3504, d3350, d7104, d7108, d7202, e5900 Fourth level: d71041
Lynas, 2014	Longitudinal observation cohort study without a control group	Individuals diagnosed with HFASD; N=67 (63 males, 4 females, age not reported)	Description of employment outcomes in relation to: employed in full-time, part-time, work experience, and feedback questionnaire	<u>Employment status</u> 56% of adults using program were employed in FT/PT positions; 66% had at 2-3 work experience opportunities <u>Vocational skills</u> Increased more than 40% in social, communication and independence skills	SE	S, M	Good (14/20), V	Second level: b117, b122, d155, d470, d720, d840, d845, d860, e360, e590 Third level: d1558, d4709, d7203, d8450, d8451, e5900

Table 4. Continued

Reference	Design	Participants	Outcome measures	Intervention results	Type of employment	Employment stage	Quality and level of evidence	ICF category codes ^{a,b}
Mawhood and Howlin, 1999	Case-controlled study	Case: individuals diagnosed with HFA; n=30 (27 males, 3 females); Age: <i>M</i> =31.1 (9.1) Control: individuals matched in intellectual and linguistic; n=20 (all male); Age: <i>M</i> =28 (6.1)	Rosenberg Self-Esteem Inventory, follow-up questionnaires in relation to support satisfaction, wages, hours worked, and relationships formed, Work Personality Profile, and feedback from employers	Employment status Experimental group had significantly higher rates of FT/casual employment ($p=0.01$), higher wages ($p=0.02$) and required less supported over time ($p=0.001$); no significant difference in hours worked (hours between 31.3-36.5); wages ranged from £3.71-£9.49	SE	S, M	Adequate (17/26), II	Second level: b117, b122, d720, d840, d845, e325, e330, e360, e590 Third level: d7203, d8450, d8451, e5900
McLaren et al., 2017	Pilot study Pretest-posttest	Individuals with ASD; N=5 (4 males, 1 females); Age: 19-28 years.	Demographic information, employment status, hourly wages, qualitative interviews	Employment status All participants obtained competitive employment in field of choosing. Wages ranged from US\$8.00-\$15.00 per hour. In addition, qualitative improvement was reported for daily living	SE	S	Limited (7/22), II	Second level: b117, b122, b40, b152, d570, d750, d760, d845, e360, e590 Third level: b1400, d5708, d7508, d7600, d8450, d8451, e5900
Morgan et al., 2014	Pilot RCT	Individuals diagnosed with ASD; N=28 (27 males, 1 female) Intervention: <i>n</i> =13; Age: <i>M</i> =25.08 (5.85) Control: <i>n</i> =15; Age: <i>M</i> = 24 (4.8)	Mock interviews, Social Pragmatic Scale (developed for study); VABS-II; Patient Health Questionnaire-9 (PHQ-9)	Vocational skills Experimental groups had increased gain in social-pragmatic skills in mock interview, no significant difference in social adaptive behaviours between groups Executive functioning skills No significant differences in depressive symptoms	C	P	Good (18/24), I	Second level: b117, b122, d310, d315, d330, d335, d350, d599, d845, e325, e360 Third level: d3500, d3501, d3502, d3503, d3504, d3102, d3150, d3350, d8450
Rausa et al., 2016	Multiple baseline across behaviours	Individual diagnosed with ASD; N=1, 23-year-old male	Imitation Disorders Evaluation; percentage of the response criteria completed correctly	Vocational skills VM improved listening, responding to orders and complaints and using professional speech with customers; skills maintained at 6-week follow up	C	P	Strong (22/22), II	Second level: b117, b122, b140, d155, d210, d310, d330, d350, d360, d845, e130 Third level: b1400, d1558, d3600, d2105, d3102, d3503, d8451, e1308

Table 4. Continued

Reference	Design	Participants	Outcome measures	Intervention results	Type of employment	Employment stage	Quality and level of evidence	ICF category codes ^{a,b}
Rosen et al., 2017	Usability evaluation Case-control study	Individuals with ASD; N=20 (18 males, 2 females), Age: <i>M</i> =18.7 (1.2) years. Typically developing controls; N=20 (18 males, 2 females), Age: <i>M</i> =16.4 (0.5) years.	Demographics, identification of adaptive/maladaptive social responses, Intrinsic Motivation Inventory (IMI), Relevance Questionnaire, Facilitator Observation Form.	<u>Vocational Skills</u> Individuals with ASD had greater difficulty than controls in selecting adaptive strategies to respond to work-related social dilemma scenarios ($p=0.02$). ASD group rated higher enjoyment ($p=0.02$) and less perceived choice ($p=0.01$) than control group. Individuals with ASD rated the applicated as more personally relevant than controls ($p<0.05$).	N/A	P	Strong (20/22) II	Second level: b117, b122, b140, d175, d310, d330, d350, d710, d740, d825, e125, e130, e360 Third level: b1400, d3500, d3501, d3502, d3503, d7100, d7103, d7108, d7400, e1250, e1300
Schall, 2010	Case study	Individual diagnosed with ASD; N=1, 25-year-old male	Functional behaviour assessment, observation of behaviour frequency	<u>Executive functioning skills</u> Positive behaviour support reduced problem behaviour through replacement strategies and positive reinforcement	C	M	Limited (4/20), V	Second level: b122, b164, d335, d349, d845, e325, e330, e360 Third level: b1641, d3551, d8450, d8451
Smith and Coleman, 1986	Case study	Individuals diagnosed with ASD and ID; N=3 (25-27 years, all male)	Behaviour observation, description of the number of tantrums, performance rate per hour	<u>Executive functioning skills</u> Behaviour management either reduced frequency of eliminated aggressive and oppositional behaviour and increased productivity	C	M	Limited (8/18), IV	Second level: b117, b122, d330, d349, d710, d845, e360 Third level: d7108, d8451
Smith et al., 2014	RCT	Individuals diagnosed with ASD; Intervention: $n=16$ (12 males, 4 females); Age: <i>M</i> =24.9 (6.7) Control: $n=10$ (8 males, 2 females); Age: <i>M</i> =23.2 (3.0)	Social Responsiveness Scale-2 (SRS-2); Repeatable battery for the assessment of neuropsychological status (RBANS); Bell-Lysaker Emotion Recognition Task (BLERT); Emotional perspective-taking task (advanced social cognition) based on the number of correct responses	<u>Vocational skills</u> Experimental group had significantly greater skills in interview role-play performance ($p=0.04$) and self-confidence ($p=0.06$) than controls	C	P, S	Strong (19/20), I	Second level: b117, b122, b140, d155, d220, d310, d330, d350, d360, d720, d845, e125, e130, e360 Third level: b1400, b1402, d1558, d2200, d3102, d3108, d3503, d3608, d7200, d8450, e1251, e1301,

Table 4. Continued

Reference	Design	Participants	Outcome measures	Intervention results	Type of employment	Employment stage	Quality and level of evidence	ICF category codes ^{a,b}
Strickland et al., 2013	RCT	Individuals diagnosed with AS or HFA; N=22, all male Intervention: n=11; Age: M=18.21 (1.03) Control: n=11; Age: M=17.66 (1.27)	Interview Skills Rating Instrument (developed for study); SRS	Vocational skills Experimental group had significantly more effective verbal skills for job interviews than the control group (p<0.000)	C	P, S	Strong (22/22), I	Second level: b117, b122, b140, d155, d220, d250, d310, d315, d330, d335, d350, d360, d720, d845, e125, e130, e360 Third level: b1400, d1558, d2200, d2501, d2502, d2503, d3100, d3102, d3150, d3350, d3503, d3608, d7203, d8450, e1251, e1301
Walsh et al., 2018	Pilot study Multiple probe design	Individuals with ASD with co-occurring ID; N=7, Age (19.2 – 22.3 years, 4 males, 3 females)	Observation during performance probes, SRS-2, Social skills Improvement Rating Scales (SSiS), ACCESS placement test	Vocational skills Significant increase in target social skills (8-14% of skills observed at baseline, 73-100% observed at posttest), significant increase in Social skills improvement rating scales score (p<0.05). Increase in ACCESS placement scores (p<0.05). Decrease in problem behaviors.	W/I/VT	P	Strong (19/20), II	Second level: b117, b1220, b140, d210, d230, d240, d330, d350, d570, d710, d720, d750, d835, e125, e130, e360 Third level: b1400, d2108, d2308, d2400, d2401, d3500, d3501, d3503, d3504, d5708, d7102, d7103, d7202, d7500, e1250, e1300
Wehman et al., 2012	Prospective cohort study	Individuals diagnosed with ASD; N=33 (19-59 years, M=25; 25 males, 8 females)	Description of employment outcomes in relation to: job title, wages, hours worked per week, benefits, average employment intervention specialist time	Employment status 82% successfully gain competitive employment with the assistance of an employment specialist, earning the same or similar wages as co-workers, working M=22.53 hours/week, wages ranged from US\$7.25- \$10.50	C	S, M	Strong (15/18), III	Second level: b117, b122, d132, d720, d845, e135, e360, e590 Third level: d7203, d8450, d8451, e1358, e5900
Wehman et al., 2013	Case study	Individuals diagnosed with AS or ASD; N=2 (19-20 years, both male)	Self-rated evaluation measure on work performance across the dimensions: performance of job skills, production rate, accuracy, communication, interaction with co-workers, appearance and safety	Employment status Both employed in different job positions for 20 hours/week; average wages US \$9.14 Vocational skills Employment program role -playing managed and improved social interactions and workplace social behaviour Executive functioning skills Improved self-management and organisational skills	C	S, M	Strong (19/22), V	Second level: b122, b164, d155, d250, d310, d315, d330, d349, d350, d710, d720, d840, d845, e135, e330, e360 Third level: b1641, b1642, d1558, d2502, d3100, d3102, d3150, d3508, d7203, d8450, d8451, e1358

Table 4. Continued

Reference	Design	Participants	Outcome measures	Intervention results	Type of employment	Employment stage	Quality and level of evidence	ICF category codes ^{a,b}
Wehman, 2014	Preliminary RCT	Individuals diagnosed with AS, ASD or PDD-NOS; N=40 Intervention: n=24 (18 males, 6 females); Age: M=19.96 (1.09) Control: n=16 (11 males, 5 females); Age: M=19.13 (1.09)	SIS, interviews to collect demographic and employment status information	Employment status Significant difference in employment attainment for experimental group (p=0.000), maintained at 3-month follow-up, increase in hours worked over 3-months; wages ranged from US\$9.00-\$9.63 per hour, no significant difference for employment support required	C	S, M	Strong (17/18), I	Second level: b122, b164, d155, d220, d250, d310, d315, d330, d349, d350, d710, d720, d840, d845, e135, e330, e360 Third level: b1641, b1642, d1558, d2208, d2502, d3100, d3102, d3150, d3508, d7203, d8450, d8451, e1358
Wehman et al., 2016b	RCT	Individuals diagnosed with AS, ASD or PDD-NOS; N=49 Intervention: n=31 (24 males, 7 females); Age: M=20.23 (1.13) Control: n=18 (11 males, 7 females); Age: M=19.33 (1.42)	SIS, interviews to collect demographic and employment status information	Employment status Intervention group more likely to be employed than control (p<0.001). Intervention group employment rates were: 74.2% at graduation and 90.3% at 3-month follow up. One-year post-graduation 87.1% maintained employment. Significant increase in wages in intervention group compared to control (p<0.001). Intervention group wages ranged from US\$9.53 to US\$10.66 per hour. Control group wages ranged from US\$9.67 to US\$10.00 per hour. At 12-month-follow up intervention group worked more hours than control group (p=0.027). Significant improvement in SIS scores for intervention group compared to control (p<0.001).	C	S, M	Strong (19/20), I	Second level: b122, b164, d155, d220, d250, d310, d315, d330, d349, d350, d710, d720, d840, d845, e135, e330, e360 Third level: b1641, b1642, d1558, d2502, d3100, d3102, d3150, d3508, d7203, d8450, d8451, e1358

Note. W/I/VT: Work experience or internship or vocational training; S: Sheltered employment; SE: Supported employment; C: Competitive employment

P: Preparing for employment; S: Seeking or securing employment; M: Maintaining employment

ASD: Autism spectrum disorder; AS: Asperger's syndrome; HFASD: High functioning ASD; PDD-NOS: Pervasive developmental disorder not-otherwise specified, according to the DSM-IV (American Psychiatric Association, 2000); ID: Intellectual disability; M: Mean; RCT: Randomised controlled trial; VM: video modelling; FT/PT: Full-time/ Part-time; PDA: Personal digital assistant

JOBS: Job Observation Behaviour Scale; ESCI: Evaluación de Solución de Conflictos Interpersonales; O-AFP: Osnabrück Ability to Work Profile; VABS-II: Vineland Adaptive Behaviour Scales-Second Edition; UDPMP: Universal Design Performance Measure for Productivity; SIB-R: Scales of Independent Behaviour-Revised; CHART: Craig Handicap Assessment and Rating Technique; SIS-EPS: Supports Intensity Scale-Employment Subscale; EPER: Employee Performance Evaluation Report; WPP: Work Personality Profile; Observational Emotional Inventory Revised; PHQ-9: Patient Health Questionnaire-9; SRS-2: Social Responsiveness Scale-Second edition; RBANS: Repeatable battery for the assessment of neuropsychological status; BLERT: Bell-Lysaker Emotion Recognition Task ^a ICF categories within the table can be found in ICF-CY version as developed by the World Health Organization (World Health Organization, 2007) ^bICF category codes defined according to the ICF Core Sets for ASD (Bölte, 2017) and linked according to the ICF linking rules (Cieza et al., 2005)

The remaining five RCTs included were all compared to no-treatment groups (Hayes et al., 2015; Smith et al., 2014; Strickland et al., 2013; Wehman et al., 2014; Wehman et al., 2016b).

Intervention outcomes

Three broad outcomes; employment status, vocational skills and executive functioning skills were evaluated (Table 4).

Employment status

Changes in employment status were examined in 12 of the 36 included studies (Burt et al., 1991; Ham et al., 2014; Hill et al., 2013; Hillier et al., 2007; Lynas, 2014; Mawhood and Howlin, 1999; Wehman et al., 2012; Wehman et al., 2013; Wehman et al., 2016b; Wehman et al., 2014; Baker-Ericzen et al., 2018; McLaren et al., 2017); measures utilised were descriptive in nature, such as employment level, wages earned, hours worked and job retention, only two standardised measures used, including the Work Personality Profile and the Support Intensity Scale (SIS). The two RCTs by Wehman et al. (Wehman et al., 2014; Wehman et al., 2016b) evaluated the effectiveness of the 'Project SEARCH plus Autism' intervention, a transition-to-work support program in comparison to high school special education services as usual. The RCTs found a statistically significant increase in the number of participants in the experimental group employed following the program compared to controls ($p=0.0001$), with an 87% job retention rate at the 12-month follow-up compared to the control group's 12% job retention rate. A study by Mawhood and Howlin (Mawhood and Howlin, 1999) evaluated an autism-specific employment support program, with the experimental group attaining significantly higher rates of full-time or casual employment ($p=0.01$), higher wages ($p=0.02$) and requiring less support over a 2-year period ($p=0.001$) compared to the control group. The remaining studies reported increased job placement and retention for individuals with ASD following intensive work-training programs and job coaching. Overall, jobs were retained from between 6 and 30 months, wages earned

ranged between US \$5.01-\$18 and an average of 25.45 hours/week were worked (Burt et al., 1991; Ham et al., 2014; Hillier et al., 2007; Wehman et al., 2012; Wehman et al., 2013; Wehman et al., 2014; Wehman et al., 2016b; Baker-Ericzen et al., 2018; McLaren et al., 2017).

Vocational skills

Twenty-three studies evaluated the change in vocational skills used in completing work-related tasks, socialising in the workplace and communicating, as shown in Table 4. A variety of standardised measures were used including the Job Observation and Behaviour Scale (Bennett et al., 2010), Evaluation for the Solutions to Interpersonal Conflicts and Osnabrück Ability to Work Profile (Bonete et al., 2015), The Scales of Independent Behaviour-Revised (Dotson et al., 2013; Liu et al., 2013), Supports Intensity Scale (SIS) (Gentry et al., 2015; Wehman et al., 2014; Wehman et al., 2016b), Employee Performance Evaluation Report (Gentry et al., 2015), Social Responsiveness Scale-2 (Smith et al., 2014; Strickland et al., 2013), Social Skills Improvement Rating Scales (Walsh et al., 2018), repeatable battery for the assessment of neuropsychological status and Bell-Lysaker Emotion Recognition Task (Smith et al., 2014). A useability study of a video-modelling intervention found that individuals with ASD had greater difficulty selecting adaptive social responses during workplace scenarios compared to typically developing controls ($P=0.02$). Though reporting that the video-modelling intervention provided less choice than controls ($p=0.01$), they reported that it was more enjoyable ($p=0.02$) and personally relevant ($p<0.05$), indicating its potential in improving social skills in vocational contexts (Rosen et al., 2017). A RCT by Bonete et al. (Bonete et al., 2015) found the experimental group reported significantly higher social problem-solving skills ($p<0.001$) and socialisation in the workplace ($p<0.001$) compared to the control group. In a RCT by Gentry et al. (Gentry et al., 2015), personal digital assistants improved the experimental group's task organisation skills resulting in significantly less hours of job coaching support ($p=0.013$) compared to the

control group. Another RCT evaluating interview performances using video modelling (Hayes et al., 2015) revealed significant improvements in interview performances ($p < 0.001$) and associated grooming and hygiene ($p = 0.02$) compared to the control group. A pre-post study (Liu et al., 2013) found their workplace training program to significantly improve the experimental group's social communication skills in the workplace ($p = 0.02$) compared to the control group and found improvements in their social workplace behaviours ($p = 0.08$). The RCT examining the effectiveness of interview skills training (Smith et al., 2014) revealed significantly greater skills in role-play performance for interviews ($p = 0.04$) and improvements in self-confidence ($p = 0.06$) compared to controls. Strickland's RCT (Strickland et al., 2013) evaluated the effectiveness of teaching interview skills reporting the experimental group ($p < 0.001$) demonstrated significantly more effective verbal skills during an interview than controls. A pilot study of the SUCCESS intervention, targeting cognitive and social skills, used an adapted version of the Social Skills Performance Assessment to provide a measure of social skills within a vocational context. Following the intervention, individuals with ASD showed improvements in both communicating with co-workers and requesting time off ($p < 0.05$). While not reaching statistical significance, parents also reported improved hygiene in areas such as dressing professionally) (Baker-Ericzen et al., 2018). The remaining studies primarily evaluated the effectiveness of vocational skills training via observation and self-report measures (Allen et al., 2010a; Allen et al., 2010b; Bennett et al., 2010; Burke et al., 2010; Burke et al., 2013; Dotson et al., 2013; Gilson and Carter, 2016; Kellems and Morningstar, 2012; Lattimore et al., 2006; Lattimore et al., 2008; Lynas, 2014; Morgan et al., 2014; Rausa et al., 2016) reporting an increase in workplace social interaction skills and the completion of targeted vocational tasks.

Executive functioning skills

Changes in executive functioning skills were examined in 11 of 36 included studies (Arikawa et al., 2013; Gentry et al., 2012; Ham et al., 2014; Schall, 2010; Smith and Coleman, 1986;

Baker-Ericzen et al., 2018), with five reporting positive changes in vocational skills, particularly in relation to employees' self-management of their workplace behaviours (Burke et al., 2010; Hayes et al., 2015; Liu et al., 2013; Morgan et al., 2014; Wehman et al., 2013). Outcome measures included observation (Arikawa et al., 2013; Burke et al., 2010; Ham et al., 2014; Smith and Coleman, 1986), self-report (Gentry et al., 2012; Hayes et al., 2015; Wehman et al., 2013) and functional behaviour assessments (Schall, 2010). Standardised measures were used in only two studies. Liu et al. (2013) used the Observational Emotional Inventory Revised, reporting that their workplace training program improved the experimental group's emotional response to socialisation resulting in improved concept of self ($p=0.04$) compared to controls. The Delis-Kaplan Executive Functioning System (DKEF-S) and the Behavior Rating Inventory of Executive Functioning – Adult (BRIEF-A) was used to provide a measure of executive functioning in a pilot study of the SUCCESS intervention, with improvements in both assessments observed ($p<0.05$) post intervention (Baker-Ericzen et al., 2018). The RCT conducted by Hayes et al. (Hayes et al., 2015) demonstrated significant improvements in the experimental group in presenting ideas logically and succinctly during an interview ($p=0.009$). Overall, studies examining executive functioning skills found that job coaches who implemented support strategies and the use of technology, such as iPods, assisted in participants' task management, problem-solving and organisational skills, improved participants' ability to self-regulate their workplace behaviours, subsequently increasing their productivity.

Linking employment program and intervention results

In total, 2,372 meaningful concepts were extracted from the 36 selected articles describing the evaluation of employment programs and interventions for individuals with ASD, as described in the previous section. These concepts were linked according to the target of the intervention, in relation to *Body functions* and *Activities and Participation*, and the modality of the intervention in relation to *Environmental factors* (Appendix A). For example, an

intervention targeting adults with ASD (*Body functions*) to improve their communication, professional behaviour and self-confidence skills in participating in a job interview (*Activities and Participation*), was delivered via a virtual reality software program (*Environmental factor*) (Smith et al., 2014). According to this linking process, concepts were linked to a total of 131 unique ICF categories from the first to the fourth level of classification. The target of interventions accounted for 87% of linked categories, with the modality of the intervention only accounting for 13% of categories. In this review, the absolute and relative frequency for the 38 second-level ICF categories, with only the categories identified in at least 5% of the linked articles are reported. Three of the ICF components are represented by these categories, with 22 from *Activities and Participation*, eight from *Environmental factors* and eight from *Body functions* (Table 4). No categories were reported that related to *Body structures*.

Activities and Participation

The greatest contribution of meaningful concepts were second level categories within the *Activity and Participation* component of the ICF (Table 5). Six of the nine chapters are represented, with Chapter 3 *Communication* denoting the main target of employment programs and interventions, with the categories, d310 *Communicating with-receiving-spoken messages*, d315 *Communicating with-receiving-non-verbal messages*, d330 *Speaking*, d350 *Conversation* and comprising the focus of interventions in more than half the studies ($k=20$). Subsequently, Chapter 8 *Major life areas*, included the most frequently identified second level category, d845 *Acquiring, keeping and terminating a job*, which was both the target of programs or interventions and the measured outcome in the majority of studies ($k=27$). The chapters of (d1) *learning and applying knowledge*, (d2) *general tasks and demands*, (d5) *self-care* and (d7) *interpersonal interactions and relationships*, spanned the remaining categories associated with the intervention targets of the studies, which

were overall aligned with well recognised work-related needs of individuals with ASD (Chen et al., 2015a).

Table 5. Absolute and relative frequencies of ICF categories from the Activity and Participation component of employment programs and intervention studies ($k=36$)

Second level category code	Category code description	N (%)
d845	Acquiring, keeping and terminating a job	27 (75%)
d155	Acquiring skills	18 (50%)
d220	Undertaking multiple tasks	18 (50%)
d330	Speaking	18 (50%)
d350	Conversation	18 (50%)
d310	Communicating with-receiving-spoken messages	16 (44%)
d250	Managing one's own behaviour	14 (38%)
d720	Complex interpersonal interactions	14 (38%)
d710	Basic interpersonal interactions	14 (38%)
d315	Communicating with-receiving-nonverbal messages	11 (31%)
d175	Solving problems	7 (19%)
d825	Vocational training	7 (19%)
d160	Focusing attention	6 (17%)
d349	Communication-producing, other specified and unspecified	6 (17%)
d840	Apprenticeship (work preparation)	6 (17%)
d335	Producing nonverbal messages	4 (11%)
d230	Carrying out daily routine	3 (8%)
d360	Using communication devices and techniques	3 (8%)
d570	Looking after one's health	3 (8%)
d750	Informal social relationships	3 (8%)
d210	Undertaking a single task	2 (6%)
d859	Work and employment, other specified and unspecified	2 (6%)

Environmental factors

Linking of meaningful concepts associated with *Environmental factors* component revealed that three of the five chapters were represented (Table 6). The most frequently linked category was e360 *Other professionals*, which described job coaches, employment coordinators and vocational rehabilitation counsellors, followed by e130 *Products and technology for education* representing products such as iPads, tablets, and specifically designed software targeting vocational skills. Concepts relating to (e5) *services, systems and policies* described vocational rehabilitation and disability support services assisting individuals with ASD to find and secure employment. It is important to note the linking

process aimed to identify those environmental categories associated with employment interventions and processes and did not describe the work environment itself. For example, the code e125 *Products and technology for communication* may refer to the use of an iPad by individuals with ASD for communication purposes, but in this context the iPad was used as a tool to deliver an intervention targeting job interview skills (Gentry et al., 2015; Smith et al., 2014). The work environment itself was not modified or influenced to improve employment outcomes.

Table 6. Absolute and relative frequencies of ICF categories from the Environmental Factors component of employment program and intervention studies ($k=36$)

Second level category code	Category code description	N (%)
e360	Other professionals	28 (78%)
e130	Products and technology for education	16 (44%)
e125	Products and technology for communication	13 (36%)
e590	Labour and employment services, systems and polices	11 (31%)
e330	People in positions of authority	8 (22%)
e325	Acquaintances, peers, colleagues, neighbours and community members	7 (19%)
e135	Products and technology for employment	4 (11%)
e585	Education and training services, systems and polices	2 (6%)

Body functions

Two of the eight chapters of the *Body functions* component were represented in the included studies (Table 7). The majority of categories were linked to Chapter 1 *Mental functions*. The most prevalent categories included b122 *Global psychosocial functions*, b177 *Intellectual functions*, b140 *Attention functions* and b164 *Higher-level cognitive functions*, all of which included ASD characteristics that are regularly targeted in interventions. This component demonstrated that interventions and programs targeted traits associated with ASD and varying difficulties in the process of preparing, finding and maintaining employment. The most frequently identified category was from the *Body functions* component, b122 *Global psychosocial functions*, indicative of the focus on interventions on impairment-related factors.

Table 7. Absolute and relative frequencies of ICF categories from the Body Functions component of employment program and intervention studies ($k=36$)

Second level category code	Category code description	N (%)
b122	Global psychosocial functions	31 (86%)
b117	Intellectual functions	25 (69%)
b140	Attention functions	12 (33%)
b164	Higher-level cognitive functions	11 (31%)
b760	Control of voluntary movement functions	4 (11%)
b130	Energy and drive functions	3 (8%)
b156	Perceptual functions	2 (6%)

Consultation with stakeholders

Focus groups were conducted with stakeholders comprising of adults with ASD, parents of individuals with ASD, employers, disability employment coordinators, practitioners and expert researchers. Stakeholders were presented with an opportunity to share their perceived concerns in relation to factors influencing the process of finding and securing a job for adults with ASD. Parents of adults with ASD stated:

Success is achieved in the workplace when people have an understanding of ASD and positive experiences with previous employees with ASD.

Stakeholders also provided feedback regarding the results of the scoping review. The stakeholders' perceived employment concerns were validated by the findings from the scoping review and confirmed that the work environment plays a critical role in influencing employment opportunities and outcomes for people with ASD. While consultation with stakeholders improved the richness of the research process, further exploration of individual perspectives would likely refine feedback and enhance the translation process given the diversity of the group. Such considerations may be beneficial when conducting future scoping review practices.

Discussion

Given that employment commonly occurs within complex environments, this scoping review used the ICF to enable a structured understanding of the factors contributing to finding and securing employment beyond the diagnosis and functioning levels of individuals with ASD (World Health Organization, 2001). This review found RCT and quasi-experimental evidence to support the effectiveness of employment interventions in adults with ASD in improving vocational skills, executive functioning in relation to job performance and employment status outcomes. Statistically significant improvements were reported for intervention participants compared to control participants across outcomes. While the research is limited, it points to the need for further interventions to be developed and evaluated.

To date, ASD research has largely focused on diagnosis and early intervention services for children, and as confirmed by the findings of the current review, a paucity of literature has focused on examining the relative effectiveness of interventions in adulthood (Schall et al., 2015; Howlin et al., 2015; Hedley et al., 2016). Of the 134 employment studies identified for inclusion in this review, only 36 were intervention-based. While these interventions studies had the stated collective purpose of improving employment outcomes, they were primarily impairment-focused, targeting their interventions at intrinsic individual ASD characteristics, with little consideration of contextual influences. Interventions targeted ASD traits commonly associated with difficulties in finding and obtaining a job, such as executive functioning skills in relation to problem-solving, organisation, task management and behaviour regulation and social communication skills required in interviews and workplace interactions (American Psychiatric Association, 2013; Hendricks, 2010; Müller et al., 2003). While many of these interventions were effective in increasing measured vocational and executive functioning skills, many participants continued to remain unemployed. The

continuing high rates of unemployment among participants following these interventions suggest that impairment-focused interventions alone are not sufficient in achieving and maintaining successful work-related outcomes for individuals with ASD (Ellenkamp et al., 2016).

One possible explanation to impairment-focused interventions could be the entrenched use of the medical model in underpinning interventions in adulthood. The medical model views ASD as a problem of the individual, requiring them to take responsibility for their disability and make the necessary personal adjustments to be eligible for employment (Dempsey and Nankervis, 2006). While the employment interventions examined in the current study did not require the individual with ASD to take responsibility for their disability, many targeted the associated traits of ASD, and subsequently developed interventions targeted at personal change to assist in eligibility in finding and keeping a job (Bonete et al., 2015; Gilson and Carter, 2016; Liu et al., 2013; Morgan et al., 2014). This was evident when linking employment interventions to the ICF Core Sets for ASD. The greatest number of categories were derived from the *Activities and Participation* component, with interventions targeting core ASD traits such as, communication (d3); learning and applying knowledge (d1) and general tasks and demands (d2), with the outcome of acquiring, keeping and terminating a job (d8). Communication had the greatest number of categories, with more than 50% of interventions targeting the communication skills of individuals with ASD as the focus in improving employment outcomes. The use of impairment-focused interventions was further supported by the *Body functions* component indicating the most frequently targeted mental functions (b1) included intellect (b117); global psychosocial functions (b122) and higher-level cognition (b164) of individuals with ASD. In an attempt to move away from the traditional medical model many interventions have incorporated environmental factors such as, products and technology (e130) and job coaches (e360) in

their approach (Allen et al., 2010a; Allen et al., 2010b; Arikawa et al., 2013; Smith et al., 2014). However, these environmental factors have merely been used as a means of delivering impairment-focused interventions, rather than being the intervention itself, i.e., an electronic device (*environmental factor*) is used to assist individuals with ASD in time and task management (*body function-executive functioning*) to improve work performance (activities and participation) (Gentry et al., 2015). The categories identified within the *Environmental factors* component indicated that support from allied health professionals, co-workers and employers (e3), organised support from government-funded services (d5) and products and technology (e1) interact with the employee with ASD and assist in determining their level of functioning in the workplace.

These findings highlight the usefulness of the biopsychosocial model of the ICF, yet no employment interventions examined in the current study have purposefully incorporated the dynamic interaction between the person and the environment into their design. Conceptualising employment interventions is hampered by the paucity of research addressing intervention design in adults with ASD (Hedley et al., 2016; Holwerda et al., 2012). However, advances such as the publication of the ICF Core Sets for ASD (Bölte et al., 2017) provide an opportunity to not only holistically synthesise the literature relating to employment of individuals with ASD, but develop interventions which consider functioning and disability and contextual factors.

Viewing individuals with ASD through an impairment-focused lens results in an imbalanced view of ASD and fails to recognise the many strengths and abilities of this group (Armstrong, 2010). It is recognised that ASD is associated with many strengths and abilities which could be utilised in work environments (de Schipper et al., 2016). In contrast to the

medical model, a strengths-based approach views the positive aspects that an individual brings to the workplace such as their talents, skills and abilities and highlights areas of competence (Steiner, 2011). This perspective promotes opportunity, performance and productivity by harnessing and developing an individual's strengths rather than counteracting their weakness (Russo, 1999; Lorenz and Heinitz, 2014). In this review, only 14 articles considered the skills and abilities of employees with ASD, and the subsequent benefits that these strengths bring to the workplace (Table 3) (Scott et al., 2017). While the skills and abilities of employees with ASD were identified, not a single study utilised a strengths-based approach in improving employment outcomes. Only two of the 14 studies incorporated the skills and abilities of individuals with ASD as part of the job matching process (Hagner and Cooney, 2005; Hillier et al., 2007). If adult-based interventions are to be more effective across the employment process, interventions should be conceptualised based on an integration of these dichotomous models. Given its biopsychosocial underpinnings, the ICF is an approach which is likely to have particular utility in this endeavor (World Health Organization, 2007). Such an integrative approach to intervention development would focus on profiling an individual's barriers and facilitators in acquiring a job and mitigating their weaknesses by promoting and supporting their strengths.

This review also highlighted the lack of intervention studies considering environmental factors and the key role that they play in facilitating or hindering work participation. Environmental factors are integral in understanding the interaction between individuals with ASD and the work context in which they are employed (Schneidert et al., 2003). While many studies incorporated environmental factors into their interventions, such as employer and co-worker support, the use of job coaches and technology, these factors were simply used as a means in delivering or implementing the intervention targeting ASD characteristics. Of the 32 intervention-based studies, not one addressed the environmental

factors as the primary target of their intervention. This finding is concerning given the argument that disability can be viewed as a social construct influenced by the environment (Shakespeare, 2013). The social model approach challenges the concept of disability as solely the responsibility of the individual and instead advocates for societal action in removing the barriers and modifying the environment to promote full participation in all major life areas (Dempsey and Nankervis, 2006; Shakespeare, 2013). Employers are considered an environmental factor in the employment process, many of which are often in influential positions to hire prospective employees, implement workplace modifications, foster inclusive workplace cultures and employ organisational policies and practices that remove barriers to work participation (Erickson et al., 2014). In addition, the use of natural supports in the work environment encourages co-workers in providing assistance, training and feedback to employees with ASD (Storey, 2003). Natural supports are recognised for their consistency and reliability in the workplace and often result in opportunities for social interaction and inclusion (Mank et al., 1997). Despite their capacity to foster a tailored work environment for employees with ASD, employers and co-workers are an overlooked and underutilised resource.

Clinical implications

Previous medicalisation of the characteristics associated with ASD has resulted in the development of adult-based interventions focusing on impairment, leading to policies and practices targeting individuals rather than the environment and social organisations (Schneidert et al., 2003). This review provides a comprehensive overview of the contextual factors that may be required for improving employment outcomes for individuals with ASD. One such contextual factor are employers, who have previously demonstrated their capacity to provide workplace accommodations (Hernandez et al., 2009; Hartnett et al., 2011). Many employers unknowingly implement a generic approach to disability in the workplace, with a limited knowledge of ASD and the unique needs and accommodations

required by this population (Richards, 2012). Employer interventions are needed to address both knowledge and understanding of ASD in the workplace and the skills required in modifying the work environment accordingly. Similarly, disability employment service providers may also benefit from such education-based interventions, as education is critical in empowering behaviour change and management (Daniali et al., 2016). Further consideration of contextual factors may include the use of natural support such as supervisors and co-workers to assist employees with ASD in completing work-related tasks, providing feedback and socialising by facilitating their job performance in the workplace (Storey, 2003). This may be achieved by providing ASD-specific education training and peer-mentoring programs to upskill supervisors and co-workers, increasing their awareness and understanding of ASD. Training programs are most likely to be cost-effective, time-efficient and easily implemented. Given the many benefits of peer-support in school-based environments for children and adolescents, such as positive behaviour change, increased cognitive, affective and social communication skills, inclusion and a sense of well-being (McCurdy and Cole, 2014; Locke et al., 2012; Schlieder et al., 2014), this approach is likely to be equally beneficial when effectively translated into the work environment.

Research gaps and future directions

This scoping review reveals several gaps in the literature. The majority of included studies did not use standardised outcome measures when evaluating employment outcomes, many of which were descriptive and observational in nature or designed specifically for a particular study without further validation. The findings from this review revealed a significant lack of reliable and valid measures assessing employment intervention outcomes for adults with ASD (Howlin et al., 2015). In order to address this issue, there is a need to explore and define what constitutes as a successful employment outcome for adults with ASD (Taylor, 2017). While the heterogeneity associated with ASD will make the process of defining employment success challenging, there will most likely be consensus in relation to

the broader definitions of certain outcomes including employment status, job satisfaction and engagement, financial gain and career growth and development. A better understanding of an individual's perceived quality of life as a result of employment may be a more effective way of capturing and unpacking success.

Limitations

There were several limitations associated with this review. Firstly, the inclusion criteria defined that only English text studies were to be included in this review, of which the majority represented a US-based perspective on employment outcomes for individuals with ASD. The lack of inclusion of non-English studies and an unequal representation across countries may present a biased view on the factors impacting employment outcomes. Next, given that adulthood and employment in ASD is an emerging area of research, much of the ASD employment literature that exists is either at a national level under the broader umbrella of disability, with many resources, services and programs lacking scientific rigour and an evidence-based approach in their development and implementation. Lastly, while a meta-analysis of the included studies would have increased the statistical power and enhanced estimates of the effect size of employment interventions, given the variability in outcomes and diffuse nature of the literature, this was not possible (Fagard, 1996).

Conclusion

This scoping review demonstrated the utility of the ICF as a comprehensive framework in reviewing and synthesising the employment literature in relation to the outcome measures used, the identified skills and abilities that individuals with ASD bring to the workplace, and the overall outcomes of employment interventions and programs. This review also promoted a more balanced approach in working with adults with ASD, encouraging the consideration of contextual factors, both environmental and personal, and their potential

to influence work participation. It is imperative that future research acknowledges the defined gaps in this review, amending future practices and research designs.

References

- Allen KD, Wallace DP, Greene DJ, et al. (2010a) Community-based vocational instruction using videotaped modeling for young adults with autism spectrum disorders performing in air-inflated mascots. *Focus on Autism and Other Developmental Disabilities* 25: 186-192.
- Allen KD, Wallace DP, Renes D, et al. (2010b) Use of video modeling to teach vocational skills to adolescents and young adults with autism spectrum disorders. *Education and Treatment of Children* 33: 339-349.
- Alverson CY and Yamamoto SH. (2016) Employment Outcomes of Vocational Rehabilitation Clients With Autism Spectrum Disorders. *Career Development and Transition for Exceptional Individuals* 40: 144-155.
- American Psychiatric Association. (2013) *Diagnostic and statistical manual of mental disorders (5th ed, text rev.)*, Arlington, VA: American Psychiatric Publishing.
- Anderson A, Moore DW, Rausa VC, et al. (2017) A Systematic Review of Interventions for Adults with Autism Spectrum Disorder to Promote Employment. *Review Journal of Autism and Developmental Disorders* 4: 26-38.
- Andersson J, Luthra R, Hurtig P, et al. (2015) Employer attitudes toward hiring persons with disabilities: A vignette study in Sweden. *Journal of Vocational Rehabilitation* 43: 41-50.
- Arikawa M, Goto H and Mineno K. (2013) Job support by occupational therapists for people with developmental disabilities: Two case studies. *Work* 45: 245-251.
- Arksey H and O'Malley L. (2005) Scoping Studies: Towards a Methodological Framework. *International Journal of Social Research Methodology* 8: 19-32.
- Armstrong T. (2010) *Neurodiversity: Discovering the extraordinary gifts of autism, ADHD, dyslexia, and other brain differences.*, Cambridge: Da Capo.
- Australian Bureau of Statistics. (2009) Autism in Australia, 2009. Canberra, ACT.
- Australian Bureau of Statistics. (2010) Survey of disability, ageing and carers; cat. no. 4430.0. Canberra, ACT: Australian Government.
- Autism Europe. (2014) Autism and work: together we can. Brussels, Belgium: Autism Europe.
- Autism Speaks. (2012) Employment Think Tank Report (Internet).
- Autism Spectrum Australia. (2013) We belong: the experiences, aspirations and needs of adults with Asperger's disorder and high functioning autism. Sydney: NSW: Autism Spectrum Australia (Aspect).
- Baker-Ericzen MJ, Fitch MA, Kinnear M, et al. (2018) Development of the Supported Employment, Comprehensive Cognitive Enhancement, and Social Skills program for adults on the autism spectrum: Results of initial study. *Autism* 22: 6-19.
- Baldwin S, Costley D and Warren A. (2014) Employment Activities and Experiences of Adults with High-Functioning Autism and Asperger's Disorder. *Journal of Autism and Developmental Disorders* 44: 2440-2449.
- Bennett K, Brady MP, Scott J, et al. (2010) The effects of covert audio coaching on the job performance of supported employees. *Focus on Autism & Other Developmental Disabilities* 25: 173-185.

- Billstedt E and Gillberg C. (2005) Autism after adolescence: population-based 13- to 22-year follow-up study of 120 individuals with autism diagnosed in childhood. *Journal of Autism & Developmental Disorders* 35: 351-360.
- Bölte S, De Schipper E, Robison JE, et al. (2014) Classification of functioning and impairment: The development of ICF core sets for autism spectrum disorder. *Autism Research* 7: 167-172.
- Bölte S, Mahdi S, de Vries PJ, et al. (2017) The Gestalt of Functioning in Autism Spectrum Disorder: Results of the International Conference to Develop Final Consensus ICF Core Sets. Manuscript submitted for publication.
- Bonete S, Calero M and Fernandez-Parra A. (2015) Group training in interpersonal problem-solving skills for workplace adaptation of adolescents and adults with Asperger syndrome: a preliminary study. *Autism* 19: 409-420.
- Briel LW and Getzel EE. (2014) In their own words: The career planning experiences of college students with ASD. *Journal of Vocational Rehabilitation* 40: 195-202.
- Bureau of Labor Statistics. (2013) America's Young Adults at 25: School enrollment, number of jobs held and labor market activity: results of a longitudinal survey. Washington DC: US: Department of Labor.
- Burgess S and Cimera RE. (2014) Employment Outcomes of Transition-Aged Adults With Autism Spectrum Disorders: A State of the States Report. *American Journal on Intellectual and Developmental Disabilities* 119: 64-83.
- Burke RV, Allen KD, Howard MR, et al. (2013) Tablet-based video modeling and prompting in the workplace for individuals with autism. *Journal of Vocational Rehabilitation* 38: 1-14.
- Burke RV, Andersen MN, Bowen SL, et al. (2010) Evaluation of two instruction methods to increase employment options for young adults with autism spectrum disorders. *Research in Developmental Disabilities* 31: 1223-1233.
- Burt DB, Fuller SP and Lewis KR. (1991) Brief report: Competitive employment of adults with autism. *Journal of Autism and Developmental Disorders* 21: 237-242.
- Bush KL and Tassé MJ. (2017) Employment and choice-making for adults with intellectual disability, autism, and down syndrome. *Research in Developmental Disabilities* 65: 23-34.
- Capo LC. (2001) Autism, employment, and the role of occupational therapy. *Work* 16: 201-207.
- Chen JL, Leader G, Sung C, et al. (2015a) Trends in Employment for Individuals with Autism Spectrum Disorder: a Review of the Research Literature. *Review Journal of Autism and Developmental Disorders* 2: 115-127.
- Chen JL, Sung C and Pi S. (2015b) Vocational Rehabilitation Service Patterns and Outcomes for Individuals with Autism of Different Ages. *Journal of Autism and Developmental Disorders* 45: 3015-3029.
- Cieza A, Brockow T, Ewert T, et al. (2002) Linking health-status measurements to the International Classification of Functioning, Disability and Health. *Journal of Rehabilitation Medicine* 34: 205-210.
- Cieza A, Ewert T, Berdirhan Üstün T, et al. (2004) Development of ICF Core Sets for patients with chronic conditions. *Journal of Rehabilitation Medicine* 36: 9-11.
- Cieza A, Geyh S, Chatterji S, et al. (2005) ICF linking rules: An update based on lessons learned. *Journal of Rehabilitation Medicine* 37: 212-218.

- Cimera RE and Cowan RJ. (2009) The costs of services and employment outcomes achieved by adults with autism in the US. *Autism* 13: 285-302.
- Cimera RE, Wehman P, West M, et al. (2012) Do sheltered workshops enhance employment outcomes for adults with autism spectrum disorder? *Autism : the international journal of research and practice* 16: 87-94.
- Clifton DO and Harter JK. (2003) *Investing in strengths*, San Francisco: Berrett-Koehler.
- Daniali SS, Shahnaz H, Kazemi S, et al. (2016) The Effect of Educational Intervention on Knowledge and Self-efficacy for Pain Control in Patients with Multiple Sclerosis. *Materia Socio-Medica* 28: 283-287.
- Daudt HML, Van Mossel C and Scott SJ. (2013) Enhancing the scoping study methodology: A large, inter-professional team's experience with Arksey and O'Malley's framework. *BMC Medical Research Methodology* 13.
- de Schipper E, Lundequist A, Coghill D, et al. (2015) Ability and Disability in Autism Spectrum Disorder: A Systematic Literature Review Employing the International Classification of Functioning, Disability and Health-Children and Youth Version. *Autism research : Official Journal of the International Society for Autism Research* 8: 782-794.
- de Schipper E, Mahdi S, de Vries P, et al. (2016) Functioning and disability in autism spectrum disorder: A worldwide survey of experts. *Autism Research* 9: 959-969.
- Dempsey I and Nankervis K. (2006) Conception of disability. In: Dempsey I, & Nankervis, K. (ed) *Community Disability Services: An evidence-based approach to practice*. Sydney, Australia: UNSW Press, 3-26.
- Ditchman NM, Miller JL and Easton AB. (2017) Vocational Rehabilitation Service Patterns: An Application of Social Network Analysis to Examine Employment Outcomes of Transition-Age Individuals With Autism. *Rehabilitation Counseling Bulletin* 61: 143-153.
- Dotson WH, Richman DM, Abby L, et al. (2013) Teaching skills related to self-employment to adults with developmental disabilities: An analog analysis. *Research in Developmental Disabilities* 34: 2336-2350.
- Eaves LC and Ho HH. (2008) Young adult outcome of autism spectrum disorders. *Journal of Autism and Developmental Disorders* 38: 739-747.
- Ellenkamp J, Brouwers E, Embregts P, et al. (2016) Work Environment-Related Factors in Obtaining and Maintaining Work in a Competitive Employment Setting for Employees with Intellectual Disabilities: A Systematic Review. *Journal of Occupational Rehabilitation* 26: 56-69.
- Erickson WA, von Schrader S, Bruyère SM, et al. (2014) The Employment Environment: Employer Perspectives, Policies, and Practices Regarding the Employment of Persons With Disabilities. *Rehabilitation Counseling Bulletin* 57: 195-208.
- Fagard RH. (1996) Advantages and disadvantages of the meta-analysis approach. *Journal of Hypertension, Supplement* 14: S9-S13.
- Farley MA, McMahon WM, Fombonne E, et al. (2009) Twenty-year outcome for individuals with autism and average or near-average cognitive abilities. *Autism Research* 2: 109-118.
- Finger ME, Escorpizo R, Glassel A, et al. (2012) ICF core set for vocational rehabilitation: results of an international consensus conference. *Disability and Rehabilitation* 34: 429-438.

- Fleming AR, Fairweather JS and Leahy MJ. (2013) Quality of Life As a Potential Rehabilitation Service Outcome: The Relationship Between Employment, Quality of Life, and Other Life Areas. *Rehabilitation Counseling Bulletin* 57: 9-22.
- Foley BE and Staples AH. (2003) Developing Augmentative and Alternative Communication (AAC) and Literacy Interventions in a Supported Employment Setting. *Topics in Language Disorders* 23: 325-343.
- Fraser R, Ajzen I, Johnson K, et al. (2011) Understanding employers' hiring intention in relation to qualified workers with disabilities. *Journal of Vocational Rehabilitation* 35: 1-11.
- Gal E, Landes E and Katz N. (2015a) Work performance skills in adults with and without high functioning autism spectrum disorders (HFASD). *Research in Autism Spectrum Disorders* 10: 71-77.
- Gal E, Selanikyo E, Erez ABH, et al. (2015b) Integration in the vocational world: How does it affect quality of life and subjective well-being of young adults with ASD. *International Journal of Environmental Research and Public Health* 12: 10820-10832.
- Garcia-Villamizar D and Hughes C. (2007) Supported employment improves cognitive performance in adults with autism. *Journal of Intellectual Disability Research* 51: 142-150.
- Garcia-Villamizar D, Wehman P and Navarro MD. (2002) Changes in the quality of autistic people's life that work in supported and sheltered employment. A 5-year follow-up study. *Journal of Vocational Rehabilitation* 17: 309-312.
- Gentry T, Kriner R, Sima A, et al. (2015) Reducing the Need for Personal Supports Among Workers with Autism Using an iPod Touch as an Assistive Technology: Delayed Randomized Control Trial. *Journal of Autism & Developmental Disorders* 45: 669-684.
- Gentry T, Lau S, Molinelli A, et al. (2012) The Apple iPod Touch as a vocational support aid for adults with autism: Three case studies. *Journal of Vocational Rehabilitation* 37: 75-85.
- Gerhardt F and Lainer I. (2011) Addressing the Needs of Adolescents and Adults with Autism: A Crisis on the Horizon. *Journal of Contemporary Psychotherapy* 41: 37-45.
- Gilson C and Carter E. (2016) Promoting Social Interactions and Job Independence for College Students with Autism or Intellectual Disability: A Pilot Study. *Journal of Autism & Developmental Disorders* 46: 3583-3596.
- Gladh L and Sjölund A. (2014) The Validation Process: A useful tool to visualize abilities and enhance the possibilities of paid employment for people with ASD. *Journal of Vocational Rehabilitation* 41: 71-76.
- Griffith GM, Totsika V, Nash S, et al. (2012) 'I just don't fit anywhere': support experiences and future support needs of individuals with Asperger syndrome in middle adulthood. *Autism* 16: 532-546.
- Hagner D and Cooney B. (2005) 'I do that for everybody': Supervising employees with autism. *Focus on Autism and Other Developmental Disabilities* 20: 91-97.
- Ham W, McDonough J, Molinelli A, et al. (2014) Employment supports for young adults with autism spectrum disorder: Two case studies. *Journal of Vocational Rehabilitation* 40: 117-124.
- Hartnett HP, Stuart H, Thurman H, et al. (2011) Employers' perceptions of the benefits of workplace accommodations: reasons to hire, retain and promote people with disabilities. *Journal of Vocational Rehabilitation* 34: 17-23.

- Hayes GR, Custodio VE, Haimson OL, et al. (2015) Mobile video modeling for employment interviews for individuals with autism. *Journal of Vocational Rehabilitation* 43: 275-287.
- Hayward SM, McVilly KR and Stokes MA. (2018) Challenges for females with high functioning autism in the workplace: a systematic review. *Disabil Rehabil* 40: 249-258.
- Hedley D, Uljarevic M, Cameron L, et al. (2016) Employment programmes and interventions targeting adults with autism spectrum disorder: A systematic review. *Autism*: 1-13.
- Hendricks D. (2010) Employment and adults with autism spectrum disorders: Challenges and strategies for success. *Journal of Vocational Rehabilitation* 32: 125-134.
- Hendricks DR and Wehman P. (2009) Transition from school to adulthood for youth with autism spectrum disorders: Review and recommendations. *Focus on Autism and Other Developmental Disabilities* 24: 77-88.
- Henninger NA and Taylor JL. (2013) Outcomes in adults with autism spectrum disorders: a historical perspective. *Autism* 17: 103-116.
- Hernandez B and McDonald K. (2010) Exploring the Costs and Benefits of Workers with Disabilities. *Journal of Rehabilitation* 76: 15-23.
- Hernandez B, McDonald K, Lepera N, et al. (2009) Moving beyond misperceptions: The provision of workplace accommodations. *Journal of Social Work in Disability and Rehabilitation* 8: 189-204.
- Higgins KK, Koch LC, Boughfman EM, et al. (2008) School-to-work transition and Asperger Syndrome. *Work* 31: 291-298.
- Hill DA, Belcher L, Brigman HE, et al. (2013) The Apple iPad™ as an Innovative Employment Support for Young Adults with Autism Spectrum Disorder and Other Developmental Disabilities. *Journal of Applied Rehabilitation Counseling* 44: 28-37.
- Hillier A, Campbell H, Mastriani K, et al. (2007) Two-Year Evaluation of a Vocational Support Program for Adults on the Autism Spectrum. *Career Development for Exceptional Individuals* 30: 125-134.
- Holwerda A, van der Klink JJ, de Boer MR, et al. (2013) Predictors of sustainable work participation of young adults with developmental disorders. *Research in Developmental Disabilities* 34: 2753-2763.
- Holwerda A, van der Klink JJ, Groothoff JW, et al. (2012) Predictors for work participation in individuals with an Autism spectrum disorder: a systematic review. *J Occup Rehabil* 22: 333-352.
- Howlin P. (2000) Outcome in Adult Life for more Able Individuals with Autism or Asperger Syndrome. *Autism* 4: 63-83.
- Howlin P, Alcock J and Burkin C. (2005) An 8 year follow-up of a specialist supported employment service for high-ability adults with autism or Asperger syndrome. *Autism* 9: 533-549.
- Howlin P, Arciuli J, Begeer S, et al. (2015) Research on adults with autism spectrum disorder: Roundtable report. *Journal of Intellectual & Developmental Disability* 40: 388-393.
- Howlin P, Goode S, Hutton J, et al. (2004) Adult outcome for children with autism. *Journal of Child Psychology and Psychiatry* 45: 212-229.
- Howlin P and Moss P. (2012) Adults with autism spectrum disorders. *The Canadian Journal of Psychiatry* 57: 275-283.

- Howlin P, Moss P, Savage S, et al. (2013) Social Outcomes in Mid-to Late adulthood among individuals diagnosed with Autism and average nonverbal IQ as children. *Journal of the American Academy of Child & Adolescent Psychiatry* 52: 572-581.
- Hurlbutt K and Chalmers L. (2004) Employment and Adults with Asperger Syndrome. *Focus on Autism and Other Developmental Disabilities* 19: 215-222.
- Järbrink K, McCrone P, Fombonne E, et al. (2007) Cost-impact of young adults with high-functioning autistic spectrum disorder. *Research in Developmental Disabilities* 28: 94-104.
- Joffe H and Yardley L. (2004) Content and thematic analysis. In: Marks DF, & Yardely, L. (ed) *Research methods for clinical and health psychology*. London, UK: Sage, 56-64.
- Johnson TD and Joshi A. (2016) Dark clouds or silver linings? A stigma threat perspective on the implications of an autism diagnosis for workplace well-being. *Journal of Applied Psychology* 101: 430-449.
- Ju S, Roberts E and Zhang D. (2013) Employer attitudes toward workers with disabilities: A review of research in the past decade. *Journal of Vocational Rehabilitation* 38: 113-123.
- Katz N, Dejak I and Gal E. (2015) Work performance evaluation and QoL of adults with High Functioning Autism Spectrum Disorders (HFASD). *Work* 51: 887-892.
- Kaya C, Chan F, Rumrill P, et al. (2016) Vocational rehabilitation services and competitive employment for transition-age youth with autism spectrum disorders. *Journal of Vocational Rehabilitation* 45: 73-83.
- Kaya C, Hanley-Maxwell C, Chan F, et al. (2018) Differential vocational rehabilitation service patterns and outcomes for transition-age youth with autism. *J Appl Res Intellect Disabil*.
- Keel JH, Mesibov GB and Woods AV. (1997) TEACCH-Supported Employment Program. *Journal of Autism and Developmental Disorders* 27: 3-9.
- Kellems RO and Morningstar ME. (2012) Using video modeling delivered through ipods to teach vocational tasks to young adults with autism spectrum disorders. *Career Development and Transition for Exceptional Individuals* 35: 155-167.
- Kirby AV, Baranek GT and Fox L. (2016) Longitudinal predictors of outcomes for adults with autism spectrum disorder: Systematic review. *OTJR Occupation, Participation and Health* 36: 55-64.
- Kmet L, Lee R and Cook L. (2004) Standard quality assessment criteria for evaluating primary research papers from a variety of fields. Edmonton: Alberta: Heritage Foundation for Medical Research (AHFMR).
- Krieger B, Kinebanian A, Prodinge B, et al. (2012) Becoming a member of the work force: perceptions of adults with Asperger Syndrome. *Work* 43: 141-157.
- Lattimore L, Parsons M and Reid D. (2006) Enhancing job-site training of supported workers with autism: A reemphasis on simulation. *Journal of Applied Behavior Analysis* 39: 91-102.
- Lattimore LP, Parsons MB and Reid D, H. (2008) Simulation training of community job skills for adults with autism: a further analysis. *Behavior Analysis in Practice* 1: 24-29.
- Lattimore LP, Parsons MB and Reid DH. (2002) A prework assessment of task preferences among adults with autism beginning a supported job. *Journal of Applied Behavior Analysis* 35: 85-88.

- Lattimore LP, Parsons MB and Reid DH. (2003) Assessing preferred work among adults with autism beginning supported jobs: identification of constant and alternating task preferences. *Behavioral Interventions* 18: 161-177.
- Lawer L, Brusilovskiy E, Salzer MS, et al. (2009) Use of vocational rehabilitative services among adults with autism. *J Autism Dev Disord* 39: 487-494.
- Lee L, Packer TL, Tang SH, et al. (2008) Self-management education programs for age-related macular degeneration: a systematic review. *Australasian Journal on Ageing* 27: 170-176.
- Leonard H, Dixon G, Whitehouse AJO, et al. (2010) Unpacking the complex nature of the autism epidemic. *Research in Autism Spectrum Disorders* 4: 548-554.
- Levac D, Colquhoun H and O'Brien KK. (2010) Scoping studies: Advancing the methodology. *Implementation Science* 5.
- Levy A and Perry A. (2011) Outcomes in adolescents and adults with autism: A review of the literature. *Research in Autism Spectrum Disorders* 5: 1271-1282.
- Liu KP, Wong D, Chung AC, et al. (2013) Effectiveness of a workplace training programme in improving social, communication and emotional skills for adults with autism and intellectual disability in Hong Kong--a pilot study. *Occupational Therapy International* 20: 198-204.
- Locke J, Rotheram-fuller E and Kasari C. (2012) Exploring the Social Impact of Being a Typical Peer Model for Included Children with Autism Spectrum Disorder. *Journal of Autism and Developmental Disorders* 42: 1895-1905.
- Lopez B and Keenan L. (2014) Barriers to employment in autism: Future challenges to implementing the Adult Autism Strategy. Autism Research Network.
- Lorenz T, Frischling C, Cuadros R, et al. (2016) Autism and Overcoming Job Barriers: Comparing Job-Related Barriers and Possible Solutions in and outside of Autism-Specific Employment. *Plos One* 11: e0147040.
- Lorenz T and Heinitz K. (2014) Aspergers - Different, Not Less: Occupational Strengths and Job Interests of Individuals with Asperger's Syndrome. *Plos One* 9.
- Lugas J, Timmons J and Smith FA. (2010) Vocational rehabilitation services received by youth with autism: are they associated with an employment outcome? Boston, MA: Institute for Community Inclusion, University of Massachusetts.
- Lynas L. (2014) Project ABLE (Autism: Building Links to Employment): A specialist employment service for young people and adults with an autism spectrum condition. *Journal of Vocational Rehabilitation* 41: 13-21.
- Magiati I, Tay XW and Howlin P. (2014) Cognitive, language, social and behavioural outcomes in adults with autism spectrum disorders: A systematic review of longitudinal follow-up studies in adulthood. *Clinical Psychology Review* 34: 78-86.
- Mank D, Cioffi A and Yovanoff P. (1997) Analysis of the typicalness of supported employment jobs, natural supports, and wage and integration outcomes. *Mental Retardation* 35: 185-197.
- Mavranezouli I, Megnin-Viggars O, Cheema N, et al. (2013) The cost-effectiveness of supported employment for adults with autism in the United Kingdom. *Autism* 0: 1-10.
- Mawhood L and Howlin P. (1999) The Outcome of a Supported Employment Scheme for High-Functioning Adults with Autism or Asperger Syndrome. *Autism* 3: 229-254.

- McCurdy EE and Cole CL. (2014) Use of a Peer Support Intervention for Promoting Academic Engagement of Students with Autism in General Education Settings. *Journal of Autism and Developmental Disorders* 44: 883-893.
- McDonough JT and Revell G. (2010) Accessing employment supports in the adult system for transitioning youth with autism spectrum disorders. *Journal of Vocational Rehabilitation* 32: 89-100.
- McDougall J, Wright V and Rosenbaum P. (2010) The ICF model of functioning and disability: incorporating quality of life and human development. *Developmental Neurorehabilitation* 13: 204-211.
- McLaren J, Lichtenstein JD, Lynch D, et al. (2017) Individual Placement and Support for People with Autism Spectrum Disorders: A Pilot Program. *Administration and policy in mental health* 44: 365-373.
- McMahon B, Van Wieren TA, Armstrong AJ, et al. (2012) Autism spectrum disorders and intellectual disabilities: A comparison of ADA Title I workplace discrimination allegations. *Journal of Vocational Rehabilitation* 36: 159-169.
- Migliore A, Butterworth J and Zalewska A. (2012a) What are the trends in employment outcomes of youth with autism: 2006-2010? Research to Practice: Institute for Community Inclusion: University of Massachusetts Boston.
- Migliore A, Butterworth J and Zalewska A. (2014) Trends in Vocational Rehabilitation Services and Outcomes of Youth With Autism: 2006–2010. *Rehabilitation Counseling Bulletin* 57: 80-89.
- Migliore A, Timmons J, Butterworth J, et al. (2012b) Predictors of Employment and Postsecondary Education of Youth With Autism. *Rehabilitation Counseling Bulletin* 55: 176-184.
- Morgan L, Leatzow A, Clark S, et al. (2014) Interview Skills for Adults with Autism Spectrum Disorder: A Pilot Randomized Controlled Trial. *Journal of Autism & Developmental Disorders* 44: 2290-2300.
- Morgan RL and Schultz JC. (2012) Towards an Ecological, Multi-Modal Approach to Increase Employment for Young Adults with Autism Spectrum Disorder. *Journal of Applied Rehabilitation Counseling* 43: 27-35.
- Mottron L, Dawson M and Soulie`res I. (2009) Enhanced perception in savant syndrome: Patterns, structure and creativity. *Philosophical Transactions of the Royal Society B* 364: 1385–1391.
- Müller E, Schuler A, Burton BA, et al. (2003) Meeting the vocational support needs of individuals with Asperger syndrome and other autism spectrum disabilities. *Journal of Vocational Rehabilitation* 18: 163-175.
- Müller E and Vangilder R. (2014) The relationship between participation in Project SEARCH and job readiness and employment for young adults with disabilities. *Journal of Vocational Rehabilitation* 40: 15-26.
- Nesbitt S. (2000) Why and why not? Factors influencing employment for individuals with Asperger syndrome. *Autism* 4: 357-369.
- Nicholas D, Attridge M, Zwaigenbaum L, et al. (2014) Vocational support approaches in autism spectrum disorder: A synthesis review of the literature. *Autism*.

- Nicholas DB, Hodgetts S, Zwaigenbaum L, et al. (2017a) Research needs and priorities for transition and employment in autism: Considerations reflected in a "special interest group" at the International Meeting for Autism Research. *Autism Research* 10: 15-24.
- Nicholas DB, Zwaigenbaum L, Zwicker J, et al. (2017b) Evaluation of employment-support services for adults with autism spectrum disorder. *Autism*: 1362361317702507.
- Nord DK, Stancliffe RJ, Nye-Lengerman K, et al. (2016) Employment in the community for people with and without autism: A comparative analysis. *Research in Autism Spectrum Disorders* 24: 11-16.
- Nye-Lengerman K. (2017) Vocational rehabilitation service usage and outcomes for individuals with Autism Spectrum Disorder. *Research in Autism Spectrum Disorders* 41-42: 39-50.
- Ohl A, Sheff MG, Little S, et al. (2017) Predictors of employment status among adults with Autism Spectrum Disorder. *Work* 56: 345-355.
- Parr AD and Hunter ST. (2013) Enhancing work outcomes of employees with autism spectrum disorder through leaderships: Leadership for employees with autism spectrum disorder. *Autism* 0: 1-10.
- Pillay Y and Brownlow C. (2016) Predictors of Successful Employment Outcomes for Adolescents with Autism Spectrum Disorders: a Systematic Literature Review. *Review Journal of Autism and Developmental Disorders*: 1-11.
- Rashid M, Hodgetts S and Nicholas D. (2017) Building Employers' Capacity to Support Vocational Opportunities for Adults with Developmental Disabilities. *Review Journal of Autism and Developmental Disorders* 4: 165-173.
- Rausa VC, Moore DW and Anderson A. (2016) Use of video modelling to teach complex and meaningful job skills to an adult with autism spectrum disorder. *Developmental Neurorehabilitation* 19: 267-274.
- Richards J. (2012) Examining the exclusion of employees with Asperger syndrome from the workplace. *Personnel Review* 41: 630-646.
- Rosen R, Weiss PL, Zancanaro M, et al. (2017) Usability of a video modeling computer application for the vocational training of adolescents with autism spectrum disorder. *British Journal of Occupational Therapy* 80: 208-215.
- Rosenblatt M. (2008) *I Exist: The Message from Adults with Autism in England*. London: National Autistic Society.
- Rosqvist HB and Keisu BI. (2012) Adaptation or recognition of the autistic subject? Reimagining autistic work life: Deconstructing the notion of 'real jobs' on the Swedish autistic self-advocacy movement. *Journal of Vocational Rehabilitation* 37: 203-212.
- Roux AM, Shattuck P, Rast JE, et al. (2015) *National Autism Indicators Report: Transition into Young Adulthood*. Philadelphia, PA: Life Course Outcomes Research Program, A.J. Drexel Autism Institute, Drexel University.
- Roux AM, Shattuck PT, Cooper BP, et al. (2013) Postsecondary employment experiences among young adults with an autism spectrum disorder. *Journal of the American Academy of Child & Adolescent Psychiatry* 52: 931-939.
- Russo RJ. (1999) Applying a strengths-based practice approach in working with people with developmental disabilities and their families. *Families in Society* 80: 25-33.
- Schall CM. (2010) Positive behavior support: Supporting adults with autism spectrum disorders in the workplace. *Journal of Vocational Rehabilitation* 32: 109-115.

- Schall CM, Wehman P, Brooke V, et al. (2015) Employment Interventions for Individuals with ASD: The Relative Efficacy of Supported Employment With or Without Prior Project SEARCH Training. *Journal of Autism and Developmental Disorders* 45: 3990-4001.
- Schaller J and Yang NK. (2005) Competitive employment for people with autism: correlates of successful closure in competitive and supported employment. *Rehabilitation Counseling Bulletin* 49: 4-16.
- Schlieder M, Maldonado N and Baltes B. (2014) An Investigation of "Circle of Friends" Peer-Mediated Intervention for Students with Autism. *Journal of Social Change* 6.
- Schneidert M, Hurst R, Miller J, et al. (2003) The role of Environment in the International Classification of Functioning, Disability and Health (ICF). *Disability and Rehabilitation* 25: 588-595.
- Scott M, Falkmer M, Girdler S, et al. (2015) Viewpoints on Factors for Successful Employment for Adults with Autism Spectrum Disorder. *Plos One* 10: e0139281.
- Scott M, Jacob A, Hendrie D, et al. (2017) Employers' perception of the costs and the benefits of hiring individuals with autism spectrum disorder in open employment in Australia. *Plos One* 12: 1-16.
- Seaman RL and Cannella-Malone HI. (2016) Vocational skills interventions for adults with autism spectrum disorder: A review of the literature. *Journal of Developmental and Physical Disabilities* 28: 479-494.
- Selb M, Escorpizo R, Kostanjsek N, et al. (2015) A guide on how to develop an International Classification of Functioning, Disability and Health Core Set. *European Journal of Physical and Rehabilitation Medicine* 51: 105-117.
- Seltzer MM, Shattuck P, Abbeduto L, et al. (2004) Trajectory of development in adolescents and adults with autism. *Mental Retardation and Developmental Disabilities Research Reviews* 10: 234-247.
- Shakespeare T. (2013) The social model of disability. In: J. LD (ed) *The Disability Studies Reader*. 4 ed. Hoboken: Hoboken : Taylor and Francis, 197-204.
- Shattuck PT, Narendorf SC, Cooper B, et al. (2012) Postsecondary education and employment among youth with an autism spectrum disorder. *Pediatrics* 129: 1042-1049.
- Shattuck PT and Roux AM. (2015) Commentary on employment supports research. *Autism: The International Journal of Research & Practice* 19: 246-247.
- Smith DL, Atmatzidis K, Capogreco M, et al. (2017) Evidence-Based Interventions for Increasing Work Participation for Persons With Various Disabilities. *OTJR: Occupation, Participation & Health* 37: 3S-13S.
- Smith M, Fleming M, Wright M, et al. (2015) Brief Report: Vocational Outcomes for Young Adults with Autism Spectrum Disorders at Six Months After Virtual Reality Job Interview Training. *Journal of Autism & Developmental Disorders* 45: 3364-3369.
- Smith MD and Coleman D. (1986) Managing the behavior of adults with autism in the job setting. *Journal of Autism and Developmental Disorders* 16: 145-154.
- Smith MJ, Ginger EJ, Wright K, et al. (2014) Virtual Reality Job Interview Training in Adults with Autism Spectrum Disorder. *Journal of Autism and Developmental Disorders* 44: 2450-2463.
- Steiner AM. (2011) A Strength-Based Approach to Parent Education for Children With Autism. *Journal of Positive Behavior Interventions* 13: 178-190.

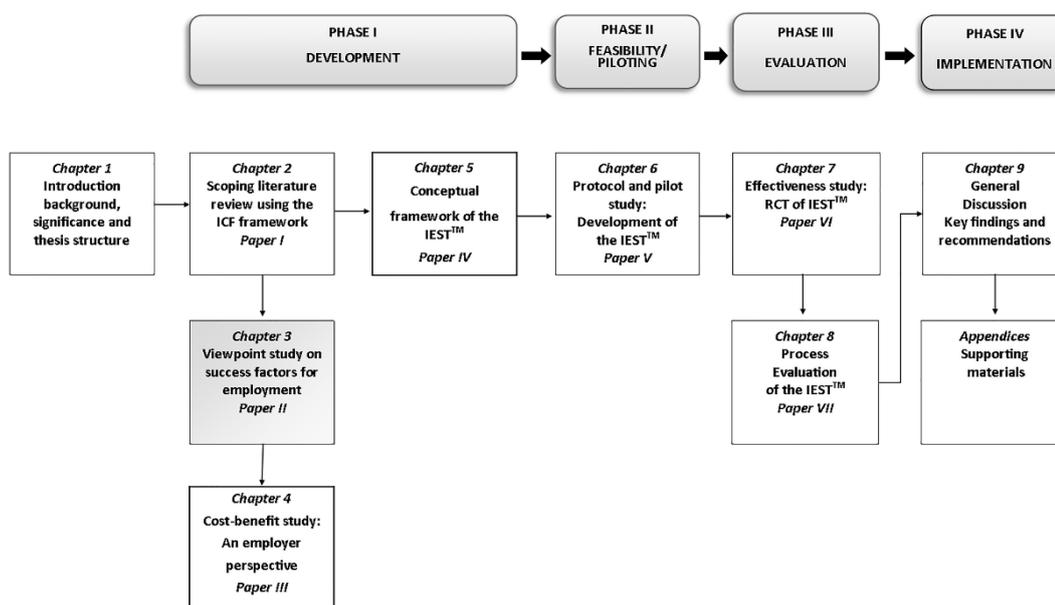
- Storey K. (2003) A review of research on natural support interventions in the workplace for people with disabilities. *International Journal of Rehabilitation Research* 26: 79-84.
- Strickland DC, Coles CD and Southern LB. (2013) JobTIPS: A transition to employment program for individuals with autism spectrum disorders. *J Autism Dev Disord* 43: 2472-2483.
- Stuckey WC. (2016) Competitive employment and autism spectrum disorder: Employer perspectives. Ann Arbor: Ball State University, 123.
- Stuckl G, Ewert T and Cieza A. (2002) Value and application of the ICF in rehabilitation medicine. *Disability and Rehabilitation* 24: 932-938.
- Sung C, Sánchez J, Kuo HJ, et al. (2015) Gender Differences in Vocational Rehabilitation Service Predictors of Successful Competitive Employment for Transition-Aged Individuals with Autism. *Journal of Autism and Developmental Disorders* 45: 3204-3218.
- Taylor J and Seltzer M. (2011) Employment and post-secondary educational activities for young adults with autism spectrum disorders during the transition to adulthood. *Journal of Autism & Developmental Disorders* 41: 566-574.
- Taylor JL. (2017) When is a good outcome actually good? *Autism*: 1-2.
- Taylor JL, Henninger NA and Mailick MR. (2015) Longitudinal patterns of employment and postsecondary education for adults with autism and average-range IQ. *Autism: The International Journal of Research & Practice* 19: 785-793.
- Taylor JL, McPheeters ML, Sathe NA, et al. (2012) A systematic review of vocational interventions for young adults with autism spectrum disorders. *Pediatrics* 130: 531-538.
- Taylor JL and Seltzer MM. (2012) Developing a vocational index for adults with autism spectrum disorders. *J Autism Dev Disord* 42: 2669-2679.
- The Joanna Briggs Institute. (2014) *JBI levels of evidence and grades of recommendation*. Available at: <http://joannabriggs.org/jbi-approach.html>.
- Unger D. (2002) Employers' Attitudes Toward Persons with Disabilities in the Workforce: Myths or Realities? *Focus on Autism and Other Developmental Disabilities* 17: 2-10.
- Van Wieren TA, Reid CA and McMahon BT. (2008) Workplace discrimination and autism spectrum disorders: the National EEOC Americans with Disabilities Act Research project. *Work* 31: 299-308.
- Vogeley K, Kirchner JC, Gawronski A, et al. (2013) Toward the development of a supported employment program for individuals with high-functioning autism in Germany. *European Archives of Psychiatry and Clinical Neuroscience* 263: 197-203.
- Walsh E, Holloway J and Lydon H. (2018) An Evaluation of a Social Skills Intervention for Adults with Autism Spectrum Disorder and Intellectual Disabilities preparing for Employment in Ireland: A Pilot Study. *Journal of Autism and Developmental Disorders* 48: 1727-1741.
- Walsh L, Lydon S and Healy O. (2014) Employment and Vocational Skills Among Individuals with Autism Spectrum Disorder: Predictors, Impact, and Interventions. *Review Journal of Autism and Developmental Disorders* 1: 266-275.
- Walsh N and Hall I. (2012) The Autism Strategy: implications for people with autism and for service development. *Advances in Mental Health & Intellectual Disabilities* 6: 113-120.
- Wanberg CR. (2012) The individual experience of unemployment. *Annual Review of Psychology*. 369-396.

- Wehman P, Brooke V, Brooke AM, et al. (2016a) Employment for adults with autism spectrum disorders: A retrospective review of a customized employment approach. *Research in Developmental Disabilities* 53–54: 61-72.
- Wehman P, Lau S, Molinelli A, et al. (2012) Supported employment for young adults with autism spectrum disorder: Preliminary data. *Research and Practice for Persons with Severe Disabilities* 37: 160-169.
- Wehman P, Schall C, McDonough J, et al. (2013) Project SEARCH for Youth With Autism Spectrum Disorders: Increasing Competitive Employment On Transition From High School. *Journal of Positive Behavior Interventions* 15: 144-155.
- Wehman P, Schall CM, McDonough J, et al. (2016b) Effects of an employer-based intervention on employment outcomes for youth with significant support needs due to autism. *Autism*: 1-15.
- Wehman P, Sima A, Ketchum J, et al. (2015) Predictors of Successful Transition from School to Employment for Youth with Disabilities. *Journal of Occupational Rehabilitation* 25: 323-334.
- Wehman PH, Schall CM, McDonough J, et al. (2014) Competitive employment for youth with autism spectrum disorders: Early results from a randomized clinical trial. *Journal of Autism & Developmental Disorders* 44: 487-500.
- Wei X, Wagner M, Hudson L, et al. (2015) Transition to Adulthood: Employment, Education, and Disengagement in Individuals With Autism Spectrum Disorders. *Emerging Adulthood* 3: 37-45.
- Westbrook JD, Nye C, Fong CJ, et al. (2012) Adult employment assistance services for persons with autism spectrum disorders effects on employment outcomes. St. Louis: Federal Reserve Bank of St Louis.
- Whetzel M. (2014) Interviewing tips for applicants with autism spectrum disorder (ASD). *Journal of Vocational Rehabilitation* 40: 155-159.
- Wilczynski SM, Trammell B and Clarke LS. (2013) Improving employment outcomes among adolescents and adults on the autism spectrum. *Psychology in the Schools* 50: 876-887.
- World Health Organization. (2001) *International Classification of Functioning, Disability and Health*, Geneva: WHO.
- World Health Organization. (2007) *International Classification of Functioning, Disability and Health: Child and Youth version*, Geneva: WHO.

Chapter 3: Paper II- Viewpoint study on success factors for employment

Preface

Chapter 3 explores the key factors for successful employment from both the viewpoints of adults on the autism spectrum and their employers. The viewpoints from both groups are contrasted for similarities and differences regarding how their views impact on the employment process. This chapter acknowledges the different needs of both employees and employers respectively, further informing the development of an autism-specific workplace tool.



This manuscript was accepted for publication on 9 September 2015, and has been published as:

Scott M, Falkmer, M., Girdler, S., & Falkmer, T. Viewpoints on Factors for Successful Employment for Adults with Autism Spectrum Disorder. PLOS One. 2015;10(10): e0139281.

The manuscript is presented in PDF format and formatted as per the guidelines for PLOS One.

RESEARCH ARTICLE

Viewpoints on Factors for Successful Employment for Adults with Autism Spectrum Disorder

Melissa Scott^{1,2}, Marita Falkmer^{1,2,3}, Sonya Girdler^{1,2}, Torbjörn Falkmer^{1,2,4}*

1 School of Occupational Therapy and Social Work, Curtin University, Perth, Western Australia, Australia, **2** Cooperative Research Centre for Living with Autism Spectrum Disorders (Autism CRC), Long Pocket, Brisbane, Queensland, Australia, **3** School of Education and Communication, CHILD programme, Institute of Disability Research, Jönköping University, Jönköping, Jönköping County, Sweden, **4** Rehabilitation Medicine, Department of Medicine and Health Science (IMH), Faculty of Health Sciences, Linköping University, Linköping, Östergötland County, Sweden

* These authors contributed equally to this work.

* T.Falkmer@curtin.edu.au



OPEN ACCESS

Citation: Scott M, Falkmer M, Girdler S, Falkmer T (2015) Viewpoints on Factors for Successful Employment for Adults with Autism Spectrum Disorder. PLoS ONE 10(10): e0139281. doi:10.1371/journal.pone.0139281

Editor: Christina Schmitz, Lyon Neuroscience Research Center, FRANCE

Received: May 14, 2015

Accepted: September 9, 2015

Published: October 13, 2015

Copyright: © 2015 Scott et al. This is an open access article distributed under the terms of the [Creative Commons Attribution License](https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Data Availability Statement: All relevant data are within the paper.

Funding: The authors acknowledge the financial support of the Cooperative Research Centre for Living with Autism Spectrum Disorders (Autism CRC), established and supported under the Australian Government's Cooperative Research Centres Program. The authors acknowledge the financial support of Curtin University to Melissa Scott through the Australian Postgraduate Award Scholarship. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Abstract

This article explores the key factors for successful employment from the viewpoints of adults with autism spectrum disorder (ASD) and employers. Two groups of individuals participated in this study, 40 adults with ASD and 35 employers. Q method was used to understand and contrast the viewpoints of the two groups. Data were analysed using by-person varimax rotation factor analysis. Results showed that although both groups appear committed to the employment process, the difference in their understanding regarding the type of workplace support required, job expectations and productivity requirements continues to hinder successful employment. These results highlight the need to facilitate communication between employees and employers to ensure a clear understanding of the needs of both groups are met. The use of an ASD-specific workplace tool may assist in facilitating the necessary communication between these two groups.

Introduction

Autism spectrum disorders (ASD) represent a category of developmental disorders, characterised by difficulties in social reciprocity, communication and unusual or repetitive behaviour [1]. With a population of 23 million in the working age 15–64 years, it is estimated that there are approximately 115, 400 adults with ASD in Australia [2]. These numbers are expected to increase over the next 10 years. This increase in the number of individuals diagnosed with ASD may partly be due to a change in the diagnostic criteria, resulting in a more accurate and earlier diagnosis [3]. As many adolescents with ASD are now exiting the school system and entering into adulthood, adult services are aware that they are under resourced to manage this period of transition [4].

In Western countries, the labour force participation rate for adults with ASD is 34%, compared with 54% for all individuals with disabilities, and 83% for individuals without disabilities [5, 6]. In fact, individuals with ASD without an intellectual impairment are three times less

Competing Interests: The authors have declared that no competing interests exist.

likely to participate in daytime activities than those with ASD who have an intellectual impairment [6, 7]. For many individuals with ASD interactional difficulties have the largest impact on their ability to apply for and maintain stable employment [8, 9]. This is particularly evident during the interview process as it is the expected requirement of demonstrating social skills and the 'ability to sell yourself' that often poses as an obstacle to gaining employment [10]. Once employed social aspects of the work environment are essential to job retention and require employees to continuously engage in social interactions and communication with colleagues [11].

For individuals with ASD it is their ability to manage the social and communication aspects of work [12, 13], rather than their actual job performance that influences their success in finding and maintaining employment [7, 9]. Despite high levels of skills and the desire to work [8], individuals with ASD continue to remain unemployed or underemployed [14]. The consequences of unemployment remains an important issue, as participation in work not only provides the opportunity to earn a livelihood, but is important in identity formation [15]. Work offers a sense of accomplishment and competence, provides structure, and offers an outlet for socialisation and enables people to be full participants in society [15, 16].

The need to support individuals with ASD in obtaining and maintaining employment is widely recognised. To date, most workplace strategies have been impairment focused and have been directed at training for individuals with ASD to overcome their social and communication difficulties [7]. Environmental factors are an essential component in understanding the complex interactions and possible success factors for individual with ASD participating in the workplace [17]. Despite this, there is a paucity of research examining the role of environmental factors in facilitating successful employment of individuals with ASD. Both personal and environmental factors are considered to impact successful employment for adults with ASD [17]. However, it remains unknown how adults with ASD view personal and environmental factors and effect on their workplace success. Hence, the primary aim of the present study was to explore the key factors for successful employment from both the viewpoints of adults with ASD and employers. A secondary aim was to contrast the viewpoints of adults with ASD and employers to explore whether their views on factors for successful employment were similar or different and how these viewpoints impact the process of employment.

Methods

The Q method provides an in-depth understanding of individuals' perspectives, attitudes and beliefs regarding a specific topic [18, 19]. In the present study, Q method was utilised to identify, categorise and reveal the viewpoints of adults with ASD and employers on factors for successful employment. The Q method has particular utility in research with adults with ASD, as it allows investigation of viewpoints while reducing the need for verbal communication and social interaction [18].

Q method has the following five phases: 1) developing the 'concourse', 2) identifying the Q sort statements, 3) administering the Q sort, 4) factor analysis and 5) interpretation of factors.

Developing the 'concourse'

The concourse lays the foundation for the statements regarding employment and was developed through various methods. A thorough search of the literature was conducted through databases: MEDLINE, Scopus, CINAHL, EMBASE, PsycINFO and Web of Science, as well as through a search of 'grey' literature. A group of expert researchers in adults with ASD was also consulted to evaluate the face validity of the concourse. The final concourse led to the development of the statements.

Identifying the Q sort statements

From the concourse, a subset of 91 employment statements was selected and printed on individual paper cards. These statements were piloted with a reference group comprising of 5 adults with ASD, parents of individuals with ASD, teachers with experience in ASD, disability employment co-ordinators, practitioners and researchers. The purpose of the reference group was to select the most relevant and appropriate statements from the original subset of 91 statements. The feedback from the reference group was used to remove statements that were deemed as 'not relevant' or difficult to read and comprehend. After the necessary adjustment, a set of 52 statements was selected for the Q-sort pack. The reference group then assessed the Q-sort pack for its readability. Based on the reference group's final feedback the Q-sort pack was finalised and used in the current study.

Administering the Q sort

Participants who met the DSM-IV criteria for ASD were invited to take part in the study and were given the opportunity to self-select as having high functioning autism or Asperger's Syndrome. This group included participants over the age of 18 years, living in Australia, who were currently employed or seeking employment. From this point forward this group of adults with ASD will be referred to as the 'Employee group'. Participants were excluded from the study if they reported co-morbid conditions distinctly different to the characteristics of ASD that would potentially require additional consideration in successfully attaining employment. The exclusion criteria included: ADHD, epilepsy and psychotic disorders. The employer group included employers who previously have employed and/or are currently employing an adult/s with ASD in their workplace and were accustomed to the employment procedure and management of the workplace environment.

Participants were recruited across Australia via: the autism associations or organisations within states, universities, disability employment services providers and social media. Information was either posted or emailed to participants explaining the purpose of the study. In total, 75 individuals agreed to participate in this study. The two groups were the employee group ($n = 40$) and the employer group ($n = 35$). Participants were presented with the choice of completing the Q sort either online or in-person using the hard copy, as shown in Fig 1. Participants were asked to carefully read through each statement, followed by sorting the 52 statements onto a sorting grid. The sorting grid ranged from 'strongly agree' to 'strongly disagree' with ranking values of +6 (strongly agree) through 0 (neutral) to -6 (strongly disagree). The sorting grid presented participants with the maximum number of statements allowed for each rank or column as shown in Fig 1. Participants were instructed that they could only place one statement in each block and that each block required a statement for the sorting grid to be complete. Participants were instructed to take their time, that there were no right or wrong answers and that they had the opportunity to re-position the statements on the grid until they were satisfied with the representation of their views. The time taken to complete the Q sort was recorded for both the online version and hard copy version completed in-person.

Factor analysis

The PQ Method software package was used to analyse the completed Q sorts [20]. The factors, i.e., the most prominent viewpoints were analysed using by-person varimax rotation factor analysis. 'This analytical method arranges the factors so that the overall rotated solution best accounts and reflects the explained variance' [21]^(p28). Furthermore, the specific Q sorts that significantly define a viewpoint at the $p < 0.05$ level together with the participants who sorted the statements similarly are revealed. A number of consensus statements were also determined.

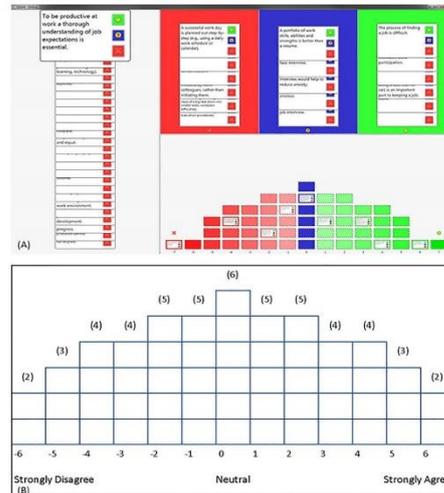


Fig 1. Q sort online and hard copy versions of the sorting grids. (A) Screen shot of participants sorting Q sort statements onto the grid using the online version of the Q sort. (B) Example of the Q sort grid normal distribution.

doi:10.1371/journal.pone.0139281.g001

Consensus statements are those in which there are no significant differences between any of the three factors.

The process of extracting factors followed strict decision-making criteria and has been described in order of importance. The first criterion was the “magic number 7”. Seven factors are considered the default number for extraction using the PQ Method software and are recommended as a starting point [20]. This criterion assists with finding the final set of factors that should account for a sizeable portion of study variance [22]. In the present study, eight factors were entered as the default. The Kaiser-Guttman criterion (eigenvalues) was the second criterion used. This follows the rule that only factors with an eigenvalue of 1.00 or above can be selected. All eight factors met this criterion. The third criterion following extraction was to accept those factors which had two or more significant factor loadings and according to Brown’s equation, i.e., significant factor loading = $2.58 \times 1 \div (\sqrt{\text{no. of items in Q set}})$. For this study the significant factor loading was ± 0.36 at the $p < 0.01$ level. Only factors 1, 2, and 3 for both the employee and employer groups satisfied this criterion (22, 23). The next criterion refers to Humphrey’s rule, which considers a factor significant if the multiplication of the two highest loadings (ignoring the positive or negative sign) is greater than twice the standard error. The standard error for this study was 0.28, resulting in factors 1, 2 and 3 fulfilling this criterion. The last criterion was to perform a ‘scree test’. A scree test involves plotting all the eigenvalues in addition to the explained variances in the percentages. The factors to be extracted are those which occur prior to an inflection in the gradient, i.e., prior to the gradient plateauing. After carefully consulting the criteria, it was determined that 3 factors from each group should be included. Three factors accounted for in 53% the explained variance the employee group and 61% of the explained variance in the employer group.

Ethics

In the present study, an information letter briefly outlining the study was sent to participants and written informed consent was obtained. Data collected from the study were de-identified and securely stored to maintain the confidentiality and privacy of participants. The study was approved through Curtin University Human Research Ethics Committee (HR141/2014) in Perth, Western Australia.

Results

Interpretation of factors

In the employee group, the three factors were defined by 37 participants (92%), where only 3 participants did not load significantly on any of the three factors. In the employer group, the three factors were defined by 33 participants (94%), and only 2 participants did not load significantly on any of these factors. Participants' demographics are presented in Table 1. A list of each statement and the corresponding rankings and z-scores across each factor can be seen in S1 Table. Once the factors for each group were identified, experts in the field were invited to participate in an open group discussion to name each viewpoint.

Factor interpretation in the employee group

Employee viewpoint 1: "I commit to work and work commits to me". Viewpoint one was defined by 17 participants, as shown in Table 2. Participants in this group included: 11 males and 6 females, with a mean age of 27.5 years ranging between 18 and 45 years. This group of participants placed great importance on commitment to work as supported by statement 11 given the ranking +5; henceforth labelled 11: +5. This employee group revealed that another factor that enhanced their commitment to work and consequently successful employment occurred when participation in their job was valued, encouraged and supported (7: +4; 3: -5; 10: -5; 8: -6). Participants were not necessarily concerned with being effectively matched to a job that promoted their skill set. Instead, these employees sought a workplace with a designated manager capable of providing the necessary workplace support (31: -4; 4: +6). This required a manager to be approachable, effective and direct in communicating and invested in

Table 1. Participant demographics.

	Employee n = 40	Employer n = 35
Age (years)		
Mean (SD)	29.1 (10.7)	44.6 (10.4)
Median	26	44
Gender (n)		
Male	24 (60%)	16 (45%)
Female	16 (40%)	19 (54%)
Employment Status (n)		
Employed	30 (75%)	
Unemployed	9 (22%)	
Retired	1 (2%)	
Q sort completion time (min)		
Mean (SD)	31 (31.6)	23.3 (10.6)
Median	20	20
Range	175	50

doi:10.1371/journal.pone.0139281.t001

Table 2. Employee Viewpoint One.

Statements	Viewpoints		
	1	2	3
16 It is important that managers are approachable in the workplace	6	3	-1
4 Receiving honest feedback on work performance assists with personal and professional development	6	3	0
11 Commitment to work is a valuable employee attribute	5	4	-3
14 A good manager assists in resolving conflict between employees to help keep the workplace fair and equal	5	1	-3
5 Being direct with colleagues is helpful when asking work related questions	5	3	-1
26 To be productive at work a thorough understanding of job expectations is essential	4	4	-5
21 Job trials help identify areas where more support is needed (e.g., identifying how tasks can be simplified or specifically adjusted)	4	0	4
7 A support plan helps to clarify the roles and responsibilities between employees and employers	4	0	3
13 Readily available support from an employment co-ordinator is essential to help with difficult work situations	4	0	1
19 Making workplace adjustments will not affect employee job performance	-4	-3	2
31 Reporting to several different managers, rather than one main manager for work is preferable	-4	-5	-1
38 Short, regular breaks during the day interrupt with concentration	-4	-1	-5
51 It is not important that employees are motivated by their work	-4	-6	-4
3 Regular follow up by an employment co-ordinator during the probation period hinders the work progress	-5	-4	-2
27 Working on a regular basis decreases life satisfaction	-5	-3	2
10 Ongoing support from an employment co-ordinator limits work performance	-5	-4	-1
15 Communication skills (e.g., listening when others are talking, responding and interacting to conversations, body language) are unimportant in most workplace	-6	6	3
8 A support plan for work should only be agreed upon by the employer, not the employee, employment co-ordinator or any colleagues or managers involved	-6	5	1

doi:10.1371/journal.pone.0139281.t002

creating an inclusive workplace (16:+6; 5: +5; 15:-6; 14: +5). An inclusive workplace demonstrated commitment to the employee's participation. Participants wanted to be included in the workplace and support-related decisions (8: -6). Overall, these participants' life satisfaction increased when regularly working (27: -5).

Employee viewpoint 2: "I'm motivated when I have the right job". Viewpoint 2 was defined by 17 participants, as shown in Table 3. This group of participants included: 10 males and 7 females with a mean age of 29.1 years ranging between 18 and 56 years. Participants in this group valued the independence they gained from being able to work (52:+6), particularly when working in a job matched to their skills and interests (48: +5; 51:-6). This group felt that their motivation and productivity at work was enhanced when they had: the skills and abilities to fulfil their role and a thorough understanding of the workplace culture and job expectations (25:+5; 24:+5, 15:-6). As this group of participants' confidence increased in their work tasks they required less support, but still valued regular follow up from one, designated manager (28:-5; 3: -4, 31:-5).

Employee viewpoint 3: "I'm confident in a structured work environment". Viewpoint 3 was defined by 3 participants, as shown in Table 4. Participants in this group included: 2 males and 1 female with a mean age of 20.5 years ranging between 20 and 21 years. These participants felt confident in their work skills, provided they had ongoing and high levels of support in their workplace (28:+5, 2:+5). This support was viewed as important and needed to be structured to include: broken-down tasks, setting work goals and simplifying tasks (40:+6). Participants also viewed job trials as an effective means to demonstrate their work capacity rather than discussing their skills in an interview (22:+5; 43:+4). To this group, the process of finding a job was

Table 3. Employee Viewpoint Two.

Statements	Viewpoints		
	1	2	3
52 Being able to work is important for independence	2	6	-4
49 Punctuality is important in the workplace	2	6	1
25 A good understanding of the workplace culture is important when beginning a new job. i.e., dress code, social etiquette, workplace values and attitudes	3	5	-2
24 It is important to have the right skills and abilities to contribute to the needs and productivity requirements of the workplace	0	5	-3
48 Job matching employees to their specific interests motivates work participation	3	5	4
11 Commitment to work is a valuable employee attribute	5	4	-3
26 To be productive at work a thorough understanding of job expectations is essential	4	4	-5
46 It would be helpful to research the workplace website before doing a job interview	-2	4	4
37 It is OK to choose to be alone during the lunchbreak	1	4	3
3 Regular follow up by an employment co-ordinator during the probation period hinders the work progress	-5	-4	-2
32 A sudden, unexplained change to the work schedule does not affect an employee's ability to continue working as per usual (e.g., staff meeting, manager is off sick, work renovations)	-3	-4	2
6 Education training on Autism Spectrum Disorders for all employed staff is unnecessary in the work environment	-3	-4	-6
10 Ongoing support from an employment co-ordinator limits work performance	-5	-4	-1
28 Constant, high level of support from an employment co-ordinator is required, even when an employee's confidence in work skills increases	-2	-5	5
8 A support plan for work should only be agreed upon by the employer, not the employee, employment co-ordinator or any colleagues or managers involved	-6	-5	1
31 Reporting to several different managers, rather than one main manager for work is preferable	-4	-5	-1
15 Communication skills (e.g., listening when others are talking, responding and interacting to conversations, body language) are unimportant in most workplaces	-6	-6	3
51 It is not important that employees are motivated by their work	-4	-6	-4

doi:10.1371/journal.pone.0139281.t003

not difficult, nor did they find being able to work added any significant value to their independence as adults (47:-6; 52:-4).

Factor interpretation for employer group

Employer viewpoint 1: "We rely on external support". Viewpoint 1 was defined by 19 participants, as shown in Table 5. Participants in this group included: 8 males and 11 females with a mean age of 43.7 years ranging between 24 and 57 years. This group of employers were open-minded with regard to employing adults with ASD in their workplace as they viewed working as an important factor in increasing life satisfaction (27:-6). However, this group felt more confident employing individuals with ASD when they received ongoing, external support from disability employment service providers (9:+6; 3:-5). The support that employers required from disability employment service providers was: assistance with difficulty work situations, periods of transition in the workplace (such as adjustments in work hours or the designated manager being on annual leave) and carrying out job trials in the workplace to identify areas where more support was needed (13:+5; 21:+4). This group viewed having a designated manager who worked directly with the employee with ASD as well as with the nominated disability employment service provider as a key factor for successful employment (31: -5; 8:-5; 10:-6).

Table 4. Employee Viewpoint Three.

Statements	Viewpoints		
	1	2	3
40 It would be good if an employee could have weekly contact with an employment co-ordinator to discuss his/her work tasks (e.g., breaking the steps of a big task down into smaller tasks, workplace difficulties)	-1	-2	6
34 The lighting of the room can affect an employee's ability to work	-1	-2	6
28 Constant, high level of support from an employment co-ordinator is required, even when an employee's confidence in work skills increases	-2	-5	5
2 It is helpful when the support required from an employment co-ordinator is re-assessed and adjusted after the probation period	3	-3	5
22 Job trials are helpful to demonstrate specific skills required in a workplace	0	1	5
43 Participating in a job trial is better than attending a face-to face interview	-2	0	4
46 It would be helpful to research the workplace website before doing a job interview	-2	4	4
21 Job trials help identify areas where more support is needed (e.g., identifying how tasks can be simplified or specifically adjusted)	4	0	4
48 Job matching employees to their specific interests motivates work participation	3	5	4
51 It is not important that employees are motivated by their work	-4	-6	-4
39 It is easier to engage in social conversations when topics are initiated by work colleagues, rather than initiating them	-3	2	-4
52 Being able to work is important for independence	2	6	-4
30 Workplace mentors can assist with daily work issues	2	1	-4
26 To be productive at work a thorough understanding of job expectations is essential	4	4	-5
29 If required, workplace mentors can give advice on appropriate social behaviour	1	1	-5
38 Short, regular breaks during the day interrupt with concentration	-4	-1	-5
6 Education training on Autism Spectrum Disorders for all employed staff is unnecessary in the work environment	-3	-4	-6
47 The process of finding a job is difficult	2	3	-6

doi:10.1371/journal.pone.0139281.t004

Employer viewpoint 2: “We provide internal support”. Viewpoint 2 was defined by 12 participants, as shown in Table 6. This group of participants included: 5 males and 7 females with a mean age of 40 years ranging between 36 and 44 years. Participants viewed working as important to increasing life satisfaction and independence (27: -6; 52: +5). Participants in this group were not overly reliant on support from an external source instead, they welcomed the opportunity to work with an employee with ASD. This group’s approach was to provide support from within their team. This included: providing on the job-training, explaining the workplace culture and encouraging effective communication skills (41:+5; 25: +4; v15:-5). Team support was reliant on a manager who promoted a fair workplace, provided honest feedback and was approachable (31:-5; 16:+6; 14:+6; 4: +4). Participants viewed training on ASD for colleagues as moderately important (6:-4).

Employer viewpoint 3: “We give the opportunity, you work it out”. Viewpoint 3 was defined by 2 participants, as shown in Table 7. This group of participants included: 1 male and 1 female with a mean age of 52.5 years ranging between 50 and 55 years. Participants in this group viewed work an important factor for independence (52: +6). This group was willing to provide job opportunities, however required employees to ensure their inclusion in the workplace. This group’s expectations of employees included: having an understanding of the job expectations to ensure productivity, having the capacity to work as team and engaging socially with colleagues (26:+5; 12: +4; 39: -4; 37: -6). Participants viewed financial assistance and ongoing support from disability employment service providers as helpful when making workplace

Table 5. Employer Viewpoint One.

Statements	Viewpoints		
	1	2	3
1 Increased support is required for employers and employees when significant changes occur in a workplace (e.g., change in job task, adjustment in work hours, manager is on leave or has resigned).	6	1	2
9 The development of an individual support plan (i.e., provides clarity on the type, frequency and duration of support required) assists in achieving successful work outcomes.	6	1	1
16 It is important that managers are approachable in the workplace	5	6	2
14 A good manager assists in resolving conflict between employees to help keep the workplace fair and equal	5	6	1
13 Readily available support from an employment co-ordinator is essential to help with difficult work situations	5	1	-4
22 Job trials are helpful to demonstrate specific skills required in a workplace	4	0	3
5 Being direct with colleagues is helpful when asking work related questions	4	0	0
21 Job trials help identify areas where more support is needed (e.g., identifying how tasks can be simplified or specifically adjusted)	4	2	-1
4 Receiving honest feedback on work performance assists with personal and professional development	4	4	-2
15 Communication skills (e.g., listening when others are talking, responding and interacting to conversations, body language) are unimportant in most workplaces	-4	5	-2
6 Education training on Autism Spectrum Disorders for all employed staff is unnecessary in the work environment	-4	-4	3
12 Working in a large team (4 or more people) is better than working in a small team (2–3 people)	-4	-3	4
51 It is not important that employees are motivated by their work	-4	-3	6
31 Reporting to several different managers, rather than one main manager for work is preferable	-5	-5	-1
8 A support plan for work should only be agreed upon by the employer, not the employee, employment co-ordinator or any colleagues or managers involved	-5	-6	-2
3 Regular follow up by an employment co-ordinator during the probation period hinders the work progress.	-5	-4	3
27 Working on a regular basis decreases life satisfaction	-6	-6	1
10 Ongoing support from an employment co-ordinator limits work performance	-6	-4	0

doi:10.1371/journal.pone.0139281.t005

adjustments (18: +5; 17: +5; 28: +4). This group did not view job matching employees to the workplace and being motivated by their work as particularly important (48: -4).

Consensus statements in the employee group

A total of five consensus statements occurred with no statistical significant difference in the scores across all three viewpoints in the employee group. They shared a neutral ranking of zero for item 50, in which all three viewpoints suggested that being able to travel independently to work was not necessarily an essential factor in keeping a job. Participants collectively disagreed that a portfolio was better than a resume (item 42; -2 to -1) and that a copy of the interview questions prior to an interview would assist in reducing anxiety (item 44; 0 to -2). Participants showed a neutrality toward financial assistance being helpful in workplace modification for employees (item 18; 0 to -2). Finally, there was strong disagreement that education training on ASD in the workplace is unnecessary for staff (item 6; -3 to -6).

Table 6. Employer Viewpoint Two.

Statements	Viewpoints		
	1	2	3
16 It is important that managers are approachable in the workplace	5	6	2
14 A good manager assists in resolving conflict between employees to help keep the workplace fair and equal	5	6	1
11 Commitment to work is a valuable employee attribute	3	5	2
41 On-the-job training helps with understanding the workplace rules (e.g., start times, finish times, break times, sick leave, holiday leave, and emergencies evacuation procedures).	1	5	1
52 Being able to work is important for independence	2	5	6
25 A good understanding of the workplace culture is important when beginning a new job. i.e., dress code, social etiquette, workplace values and attitudes	2	4	3
49 Punctuality is important in the workplace	1	4	2
24 It is important to have the right skills and abilities to contribute to the needs and productivity requirements of the workplace	2	4	-2
4 Receiving honest feedback on work performance assists with personal and professional development	4	4	-2
32 A sudden, unexplained change to the work schedule does not affect an employee's ability to continue working as per usual (e.g., staff meeting, manager is off sick, work renovations)	-3	-4	0
10 Ongoing support from an employment co-ordinator limits work performance	-6	-4	0
6 Education training on Autism Spectrum Disorders for all employed staff is unnecessary in the work environment	-4	-4	3
3 Regular follow up by an employment co-ordinator during the probation period hinders the work progress	-5	-4	3
15 Communication skills (e.g., listening when others are talking, responding and interacting to conversations, body language) are unimportant in most workplaces	-4	-5	-2
31 Reporting to several different managers, rather than one main manager for work is preferable	-5	-5	-1
28 Constant, high level of support from an employment co-ordinator is required, even when an employee's confidence in work skills increases	-3	-5	4
27 Working on a regular basis decreases life satisfaction	-6	-6	1
8 A support plan for work should only be agreed upon by the employer, not the employee, employment co-ordinator or any colleagues or managers involved	-5	-6	-2

doi:10.1371/journal.pone.0139281.t006

Consensus statements in the employer group

There were nine consensus statements with no statistical significant difference in the scores across all three viewpoints in the employer group. They shared a negative ranking for items 19 (disagree; -3) and 39 (-2 to -4) in all three viewpoints. This indicated that employees' work performance is affected when workplace adjustments are made, and that social engagement is not always made easier when initiated by a work colleague. Participants shared a moderately high positive ranking (1 to 4) regarding the importance of understanding the culture of workplace (item 25) and punctuality (item 49) when beginning a new job. Four items shared moderate neutrality across all viewpoints with rankings moving between slightly disagree to slightly agree. This was evident in items relating to: working in a quiet environment (item 35; -2 to 1), that structured planning resulted in a successful work day (item 36; -1 to 2), a portfolio was better than a resume (item 42; -2 to 2) and lastly, that a copy of the interview questions prior to an interview would assist in reducing anxiety (item 44; 0 to -2). A moderately high positive ranking (0 to 4) indicated that employers viewed participating in a work trial as better than a face-to-face interview (item 43).

Table 7. Employer Viewpoint Three.

Statements	Viewpoints		
	1	2	3
52 Being able to work is important for independence	2	5	6
51 It is not important that employees are motivated by their work	-4	-3	6
26 To be productive at work a thorough understanding of job expectations is essential	3	1	5
18 Financial assistance from the Employment Assistance Fund is helpful in allowing workplaces to make workplace adjustments for employees	0	-2	5
17 Assistance from an employment co-ordinator is necessary when applying for funding for workplace adjustments	-2	1	5
43 Participating in a job trial is better than attending a face-to face interview	0	2	4
47 The process of finding a job is difficult	-1	1	4
12 Working in a large team (4 or more people) is better than working in a small team (2–3 people)	-4	-3	4
28 Constant, high level of support from an employment co-ordinator is required, even when an employee's confidence in work skills increases	-3	-5	4
39 It is easier to engage in social conversations when topics are initiated by work colleagues, rather than initiating them	-2	-2	-4
29 If required, workplace mentors can give advice on appropriate social behaviour	1	0	-4
48 Job matching employees to their specific interests motivates work participation	2	0	-4
33 It would be helpful to use technology to assist with on-the-job learning (e.g., use of the iPad for video modellings, to increase work speed and accuracy, visual prompts or work schedule)	-1	2	-4
40 It would be good if an employee could have weekly contact with an employment co-ordinator to discuss his/her work tasks (e.g., breaking the steps of a big task down into smaller tasks, workplace difficulties).	0	-2	-5
23 Businesses value a broad range of skills in their employees (e.g., communication, problem-solving, learning, technology)	-1	3	-5
30 Workplace mentors can assist with daily work issues	3	0	-5
34 The lighting of the room can affect an employee's ability to work	-1	0	-6
37 It is OK to choose to be alone during the lunchbreak	-1	-1	-6

doi:10.1371/journal.pone.0139281.t007

Discussion

This study identified three main viewpoints within both the employee and employer Q-sample. In order to better understand these results the *International Classification of Functioning, Disability and Health (ICF)* framework was used [23]. The ICF is based on a biopsychosocial perspective of health. It serves as a useful framework to understand functioning and disability and the complex interaction between contextual factors, namely environmental and personal factors, and their impact on adults with autism and employment [17]. The ICF highlights the necessary role that environmental factors play in acting as a facilitator or barrier to participation [24]. Therefore, the ICF was used to categorise the viewpoints on employment of both groups of participants according to the environment, participation or activity, as shown in S1 Fig. According the ICF, the *environment* includes: the physical, social and attitudinal contexts; *participation* is the involvement in a life situation and *activity* is the execution of a task by an individual [23]. Lastly, the ICF was used as a means of contrasting and interpreting the viewpoints between the employee and employer group. This was achieved by mapping the viewpoints for each group onto the ICF framework, as seen in S1 Fig.

Viewpoint one of the employee group, *'I commit to work and work commits to me'*, was categorised as *participation* according the ICF. This suggests that when the employee group is

made to feel included in the workplace, whereby their talents and skills are valued and they are actively involved in workplace decisions, their dedication to work is reinforced [7, 8]. This suggests that employees view the inclusiveness of the workplace as an important facilitator to work participation. In contrast, Viewpoint one of the employer group, 'We rely on external support', was categorised as *the environment* according to the ICF. Literature reports that one of the factors related to work participation for adults with ASD is having the support of the employer. This includes: modification of the work environment, job adjustments and behavioural management [25]. However, the employer group indicated a lack of confidence implementing workplace modifications without the support and guidance of disability employment organisations [26, 27]. These findings are of interest given that while both the employee and employer groups view support in the workplace as important, the type of support that each group requires differs significantly. The discrepancy in the type of support required by each group may in part account for miscommunication between employees and employers when attempting to create a successful workplace [9].

Viewpoint two of the employee group, 'I'm motivated to work in the right job' and the employer group, 'We provide internal support' were categorised into *activity* and *participation* respectfully, according to the ICF. The employee and employer groups agreed on the importance of work productivity, however their understanding of the job expectations required to achieve this goal of productivity differed [28, 29]. Job expectations are reciprocal and must be considered from both the employee and employer's perspective. Employees expect responsibility, career advancement, fair pay and job tasks to match their skills and abilities [7, 28]. In exchange, employers expect hard work, loyalty, minimum length of stay and productivity [30]. However, unclear or conflicting expectations between employees and employers are unclear may result in demotivated employees, poor work performance, stress and increased employee turnover [30]. Successful work environments depend on clear descriptions of the specific requirements of the job, a shared understanding of the time in which tasks need to be completed, appropriate training, the necessary resources and a supportive workplace culture [7, 30]. It is likely that work environments which adopt these approaches will create workplaces in which individuals with ASD can excel.

Viewpoint three of the employee group, 'I'm confident in a structured work environment', and the employer group, 'We give the opportunity, you work it out' differed significantly in their approaches toward successful employment. This is indicated in the categorisation of each group into *the environment* and *activity* respectively according to the ICF. The employee and employer groups agreed on the ease of completing the basic business transaction of recruitment for a job position, which included applying for the job position and hiring for the job position. However, the two groups differed in their approach to the process of maintaining a job [29]. Using the ICF *environmental* component, employees require a supportive, structured and task-adapted work environment to perform their jobs successfully [7, 8, 31]. This suggests that it is the manner in which the environment is structured and modified that influences job retention [32]. In contrast, the employer group presented a different view regarding job retention. This best aligns with the ICF *activity* component in that employers are focused on the execution of job tasks to further business productivity [23]. This suggests that once employers have provided the opportunity to work it is the employee's responsibility to meet the productivity requirements, in order to maintain their job [10, 28]. The strong differences in viewpoints regarding job retention may explain the difficulty employees have in maintaining a job, which likely results from the lack of available support [25, 27]. As well as, if an employee cannot meet the productivity requirements this may impact and lower the business's profitability. As a result of lowered productivity employers may find it difficult to retain the jobs of employees who are not performing according to the productivity requirements of the business [8]. This

suggests that if job retention is regarded as both the responsibility of the employee and the employer then effective communication regarding productivity in the workplace is required.

This study has revealed that the viewpoints between the employee and employer groups are positioned differently within the framework of the ICF. This difference in the groups' viewpoints may explain why successfully gaining and maintaining employment for individuals with ASD is a challenge. Although both groups appear committed to the employment process, the difference in their understanding regarding the type of workplace support required, job expectations and productivity requirements continues to hinder successful employment. There is clearly a need for an approach which facilitates communication between employees and employers to bridge the communication gap. This study suggests that an ASD-specific workplace tool is required for employers, which may assist in bridging this communication gap between groups. This tool would also provide employers with essential and practical information to effectively manage and modify the workplace for successful employment outcomes.

Limitations

It is essential that the Q sort comprises a thorough representation of condensed information relating to ASD and employment [22]. In addition, participants were asked to suggest any areas where information may not have been included in the Q sort. Participants suggested a few areas that should contain more statements. This included: using a visual schedule at work for organisation, having access to a work place mentor, making workplace adjustments and the enjoyment of work. However, the Q sort pack contained statements relating to each of these suggestions (statements 33, 30, 19 and 27, respectively, as seen in S1 Table). Moreover, participants made mention of the need for statements to address workplace bullying, work-related anxiety experiences and disclosure of ASD to an employer and colleagues. This suggests that although the chosen statements were generally representative, there were three areas that will need to be addressed in future studies.

Conclusion

According to the employee and employer groups, factors for successful employment include: comprehensive job expectations, knowledge of the productivity requirements and support in the workplace to assist in creating an inclusive and modified environment. However, it is the difference of interpretation of each factor that may explain the miscommunication between employees and employers in the workplace and ultimately impact on job retention. This study highlights the need for an approach which facilitates communication between both the employee and employer. The development of an ASD-specific workplace tool may assist in bridging the gap of miscommunication between employees and employers in the workplace as well as assisting with workplace modifications for successful employment outcomes.

Supporting Information

S1 Table. Q Sort statements, factor arrays and z scores for each viewpoint in both the employee group (EE) and the employer group (ER).
(DOCX)

S1 Fig. Interaction between the components of the ICF. This figure is based on the World Health Organization ICF framework.
(TIF)

Acknowledgments

Our sincere thanks go to Wilson Waters, the software engineer from Alintech. The online version of the Q sort would not have been possible without your development and innovation. We are grateful to all the participants, their families and businesses who participated. A special mention goes to EDGE Employment Solutions, EPIC Employment Service, Barkuma's Personnel Employment in South Australia, Autism Spectrum Australia and AIM Employment of the Autism Association of Western Australia, for their assistance with participant recruitment in this study.

The authors acknowledge the financial support of the Cooperative Research Centre for Living with Autism Spectrum Disorders (Autism CRC), established and supported under the Australian Government's Cooperative Research Centres Program.

Author Contributions

Conceived and designed the experiments: MS MF SG TF. Performed the experiments: MS. Analyzed the data: MS MF SG TF. Contributed reagents/materials/analysis tools: MS MF SG TF. Wrote the paper: MS MF SG TF.

References

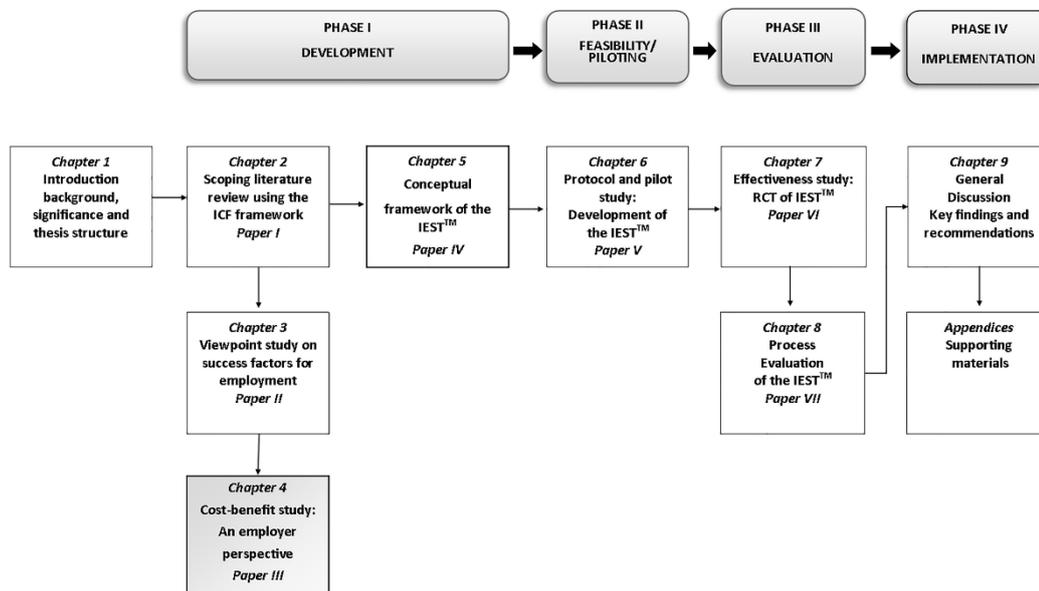
1. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (4th ed, text rev.). Washington, DC: Author; 2000.
2. Statistics ABo. Autism in Australia; cat. no. 4428.0. Canberra, ACT: Australian Government, 2012.
3. Leonard H, Dixon G, Whitehouse AJO, Bourke J, Aiberti K, Nassar N, et al. Unpacking the complex nature of the autism epidemic. *Research in Autism Spectrum Disorders*. 2010; 4(4):548–54. doi: <http://dx.doi.org/10.1016/j.rasd.2010.01.003>
4. Taylor JL, Seltzer MM. Developing a vocational index for adults with autism spectrum disorders. *J Autism Dev Disord*. 2012; 42(12):2669–79. doi: [10.1007/s10803-012-1524-x](https://doi.org/10.1007/s10803-012-1524-x) PMID: 22466690; PubMed Central PMCID: PMC3484183.
5. Howlin P, Goode S, Hutton J, Rutter M. Adult outcome for children with autism. *Journal of Child Psychology and Psychiatry*. 2004; 45(2):212–29. PMID: 14982237
6. Taylor JL, Seltzer MM. Employment and post-secondary educational activities for young adults with autism spectrum disorders during the transition to adulthood. *J Autism Dev Disord*. 2011; 41(5):566–74. doi: [10.1007/s10803-010-1070-3](https://doi.org/10.1007/s10803-010-1070-3) PMID: 20640591; PubMed Central PMCID: PMC3033449.
7. Hillier A, Campbell H, Mastriani K, Izzo MV, Kool-Tucker AK, Cherry Lea. Two-Year Evaluation of a Vocational Support Program for Adults on the Autism Spectrum. *Career Development for Exceptional Individuals*. 2007; 30(1):125–34.
8. Hendricks D. Employment and adults with autism spectrum disorders: Challenges and strategies for success. *Journal of Vocational Rehabilitation*. 2010; 32(2):125–34.
9. Muller E, Schuler A, Burton BA, Yates GB. Meeting the vocational support needs of individuals with Asperger syndrome and other autism spectrum disabilities. *Journal of Vocational Rehabilitation*. 2003; 18:163–75.
10. Hagner D, Cooney BF. "I do that for everybody": Supervising employees with autism. *Focus on Autism and Other Developmental Disabilities*. 2005; 20(2):91–7. doi: [10.1177/10883576050200020501](https://doi.org/10.1177/10883576050200020501)
11. Vogeley K, Kirchner JC, Gawronski A, Tebartz van Elst L, Dziobek I. Toward the development of a supported employment program for individuals with high-functioning autism in Germany. *European Archives of Psychiatry and Clinical Neuroscience*. 2013; 263:197–203. doi: [10.1007/s00406-013-0455-7](https://doi.org/10.1007/s00406-013-0455-7)
12. Lawer L, Brusilovskiy E, Salzer MS, Mandell DS. Use of vocational rehabilitative services among adults with autism. *J Autism Dev Disord*. 2009; 39(3):487–94. doi: [10.1007/s10803-008-0649-4](https://doi.org/10.1007/s10803-008-0649-4) PMID: 18810627.
13. Tantam D. Psychological disorder in adolescents and adults with Asperger's syndrome. *Autism*. 2000; 4(1):47–62.
14. Burke RV, Andersen M. N., Bowen S. L., Howard M. R., & Allen K. D. Evaluation of two instruction methods to increase employment options for young adults with autism spectrum disorders. *Research in Developmental Disabilities*. 2010; 31(6):1223–33. PMID: 20800988. doi: [10.1016/j.ridd.2010.07.023](https://doi.org/10.1016/j.ridd.2010.07.023)

15. Krieger B, Kinebanian A, Prodinge B, Heigl F. Becoming a member of the work force: perceptions of adults with Asperger Syndrome. *Work*. 2012; 43(2):141–57. doi: [10.3233/WOR-2012-1392](https://doi.org/10.3233/WOR-2012-1392) PMID: [22927626](https://pubmed.ncbi.nlm.nih.gov/22927626/).
16. Capo LC. Autism, employment, and the role of occupational therapy. *Work*. 2000; 16:201–7.
17. McDougall J, Wright V, Rosenbaum P. The ICF model of functioning and disability: incorporating quality of life and human development. *Developmental Neurorehabilitation*. 2010; 13(3):204–11. doi: [10.3109/17518421003620525](https://doi.org/10.3109/17518421003620525) PMID: [2010656550](https://pubmed.ncbi.nlm.nih.gov/2010656550/). Language: English. Entry Date: 20100716. Revision Date: 20100716. Publication Type: journal article.
18. Corr S. Exploring perceptions about services using Q-methodology. In: Kielhofner G, editor. Philadelphia: F. A. Davis Company; 2006.
19. Brown S. Political Subjectivity: Application of Q Methodology in Political Science. New Haven, CT: Yale University Press; 1980.
20. Schmolck P. PQ Method Manual 2002 [cited 2015 2 March]. Available from: <http://schmolck.org/qmethod/pqmanual.htm>.
21. Chee DY-T, Lee HC-y, Falkmer M, Barnett T, Falkmer O, Sijehav J, et al. Viewpoints on driving of individuals with and without Autism Spectrum Disorder. *Developmental Neurorehabilitation*. 2015; 18(1):26–36. doi: [10.3109/17518423.2014.964377](https://doi.org/10.3109/17518423.2014.964377) PMID: [25280078](https://pubmed.ncbi.nlm.nih.gov/25280078/)
22. Watts S, Stenner P. *Doing Q Methodological Research: Theory, Method and Interpretation*. London: SAGE Publications Ltd; 2012.
23. World Health Organization. *International Classification of Functioning, Disability and Health*. Geneva 2001.
24. Schneidert M, Hurst R, Miller J, Ustun B. The role of Environment in the International Classification of Functioning, Disability and Health (ICF). *Disability and Rehabilitation*. 2003; 25(11–12):588–95. PMID: [12959332](https://pubmed.ncbi.nlm.nih.gov/12959332/)
25. Burt DB, Fuller S, Lewis KR. Competitive employment of adults with autism. *Journal of Autism and Developmental Disorders*. 1991; 21:237–42. PMID: [1864830](https://pubmed.ncbi.nlm.nih.gov/1864830/)
26. Howlin P, Alcock J, Burkin C. An 8 year follow-up of a specialist supported employment service for high-ability adults with autism or Asperger syndrome. *Autism*. 2005; 9:533–49. doi: [10.1177/1362361305057871](https://doi.org/10.1177/1362361305057871) PMID: [16287704](https://pubmed.ncbi.nlm.nih.gov/16287704/)
27. Mawhood L, Howlin P. The Outcome of a Supported Employment Scheme for High-Functioning Adults with Autism or Asperger Syndrome. *Autism*. 1999; 3(3):229–54. doi: [10.1177/1362361399003003003](https://doi.org/10.1177/1362361399003003003)
28. Rousseau DM. New hire perceptions of their own and their employer's obligations: A study of psychological contracts. *Journal of Organizational Behavior*. 1990; 11:389–400.
29. Hurlbutt K, Chalmers L. Employment and Adults with Asperger Syndrome. *Focus on Autism and Other Developmental Disabilities*. 2004; 19(4):215–22. PMID: [205057164](https://pubmed.ncbi.nlm.nih.gov/205057164/).
30. Adler L. *Hiring With Your Head. Using Performance-Based Hiring to Build Great Teams*. Hoboken, New Jersey: John Wiley & Sons Inc 2007.
31. Hendricks D. Employment and adults with autism spectrum disorders: Challenges and strategies for success. 2010.
32. Keel J, Mesibov G, Woods A. TEACCH-Supported Employment Program. *Journal of Autism and Developmental Disorders*. 1997; 27(1):3–9. PMID: [9018578](https://pubmed.ncbi.nlm.nih.gov/9018578/)

Chapter 4: Paper III- Cost-benefit study: An employer perspective

Preface

Chapter 4 explores the costs and benefits of hiring and supporting an individual on the autism spectrum from the employers' perspective. This study was informed by a published systematic review that can be found in Appendix B. The systematic review uncovered that the costs and benefits of employing an individual on the autism spectrum has previously been considered from the perspective of the employee, taxpayer and society, but few studies have considered the employer perspective. This chapter examines the cost variables, as well as employer attitudes associated with hiring and supporting individuals on the autism spectrum, further exploring the impact of environmental factors on employment.



This manuscript was accepted for publication on 28 April September 2017, and has been published as:

Scott M, Jacob, A., Hendrie, D., Parsons, R., Girdler, S., Falkmer, T., & Falkmer, M.

Employers' perception of the costs and the benefits of hiring individuals with autism spectrum disorder in open employment in Australia. PLOS One.

2017;12(5):1-16.

The manuscript is presented in PDF format and formatted as per the guidelines for PLOS One.

RESEARCH ARTICLE

Employers' perception of the costs and the benefits of hiring individuals with autism spectrum disorder in open employment in Australia

Melissa Scott^{1,2}*, Andrew Jacob¹, Delia Hendrie³, Richard Parsons^{1,4}, Sonya Girdler^{1,2}, Torbjörn Falkmer^{1,2,5}, Marita Falkmer^{1,2,6}

1 School of Occupational Therapy and Social Work, Curtin University, Perth, Western Australia, Australia, **2** Cooperative Research Centre for Living with Autism (Autism CRC), Brisbane, Queensland, Australia, **3** School of Public Health, Curtin University, Perth, Western Australia, Australia, **4** School of Pharmacy, Curtin University, Perth, Australia, **5** Rehabilitation Medicine, Department of Medicine and Health Science (IMH), Linköping University, Linköping, Sweden, **6** School of Education and Communication, CHILDR programme, Institute of Disability Research, Jönköping University, Jönköping, Sweden

* These authors contributed equally to this work.
* melissa.scott@curtin.edu.au



OPEN ACCESS

Citation: Scott M, Jacob A, Hendrie D, Parsons R, Girdler S, Falkmer T, et al. (2017) Employers' perception of the costs and the benefits of hiring individuals with autism spectrum disorder in open employment in Australia. PLoS ONE 12(5): e0177607. <https://doi.org/10.1371/journal.pone.0177607>

Editor: Grainne Mary McAlonan, King's College London, UNITED KINGDOM

Received: November 28, 2016

Accepted: April 28, 2017

Published: May 18, 2017

Copyright: © 2017 Scott et al. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Data Availability Statement: Data cannot be made publicly available for ethical reasons. This project has not been granted ethics to release the data publicly as it would compromise the confidentiality of participants and the sensitive nature of the data collected regarding their businesses, companies and organisations. Requests for additional information on these restrictions may be directed to: Wendy Jacobs (Ethics Support Officer-Health Sciences, Research Integrity, Office of Research and Development, Tel: +61 8 9266 1792, Email:

Abstract

Research has examined the benefits and costs of employing adults with autism spectrum disorder (ASD) from the perspective of the employee, taxpayer and society, but few studies have considered the employer perspective. This study examines the benefits and costs of employing adults with ASD, from the perspective of employers. Fifty-nine employers employing adults with ASD in open employment were asked to complete an online survey comparing employees *with* and *without* ASD on the basis of job similarity. The findings suggest that employing an adult with ASD provides benefits to employers and their organisations without incurring additional costs.

Introduction

Although previously described in the Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-V) [1], the terms Asperger syndrome and pervasive developmental disorder not otherwise specified (PDD-NOS) are now considered under the broader diagnosis of Autism Spectrum Disorder (ASD) as outlined in the DSM-V [2]. ASD represents a distinct category of developmental disabilities, characterised by difficulties in social interaction and communication, and restricted or repetitive behaviours [2]. The term ASD is among one of the preferred terms by the autism community and professionals [3]. For the purpose of this article, the term ASD will be used throughout to represent individuals on the autism spectrum, who do not have an intellectual disability, working in open employment, and acknowledges that the participants in the current study did not represent the whole autism spectrum.

Work is a source of economic independence with many benefits beyond those of financial gain [4], offering a sense of accomplishment and competence, providing structure, opportunities

ORD-ethicshs@curtin.edu.au) or Peter O'Leary (Chair of Human Research Ethics Committee, Tel: +61 8 9266 2784, Email: hrec@curtin.edu.au).

Funding: The authors acknowledge the financial support of the Bankwest Curtin Economics Centre and the Cooperative Research Centre for Living with Autism (Autism CRC), established and supported under the Australian Government's Cooperative Research Centres Program. The authors acknowledge the financial support of Curtin University to Melissa Scott through the Australian Postgraduate Award Scholarship. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Competing interests: All authors have had full access to the data, analysis and writing, revision and editing has jointly been done. The authors have declared that no competing interests exist.

for socialisation, facilitating contribution to society and less reliance on government funding [5–7]. For adults with ASD the motivation for engaging in employment is no different to those of the general working population. Every individual *with* and *without* a disability has the right to work, to freely choose their employment, to work in just and favourable conditions and to be protected against unemployment [8]. Australia has among the lowest rates of employment of individuals with disability in the Organisation for Economic Co-operation and Development (OECD), with adults with ASD underrepresented in employment even in comparison to other disability groups [6, 9]. In Australia, the labour force participation rate for adults with ASD is 42% in comparison to 53% of all individuals with disabilities, and 83% for individuals without disabilities [10, 11]. However, Australian labour force participation rates for adults with ASD are high compared to other countries including the United Kingdom with only 15% of adults of working age with ASD in full-time paid employment [12, 13] and similarly in the United States where only 11% of adults with ASD are reported to be competitively employed [14, 15].

The core characteristics associated with ASD often result in adults with ASD confronting difficulties finding and securing employment [16, 17]. While the specific difficulties experienced by adults with ASD in obtaining employment may vary [18], they commonly include: promoting themselves in an interview, difficulty adjusting to new work environments and routines (including sensory sensitivities in the workplace), remembering and following instructions, planning and multi-tasking, communicating effectively and socially interacting with co-workers [16, 18–20]. In contrast, adults with ASD may perform well in job tasks that require systematic information processing, a high degree of accuracy in visual perception, precise technical abilities, increased concentration for long periods of time and a high tolerance for repetitive tasks [18, 21, 22]. Employees with ASD may also possess other qualities attractive to employers, including trustworthiness, reliability, integrity, attention to detail and low absenteeism [19, 21, 23]. In an evaluation of 38 employers' expectations of job performance, employers rated punctuality, willingness to work hard and attendance as the most important aspects of a job [24, 25]. Despite many adults with ASD demonstrating these particular strengths once employed, low employment rates suggest that other factors are influencing their employability [21].

A variety of external factors have been proposed as barriers to successful employment for adults with ASD, including a lack of specific vocational support services, traditional job application and interviewing processes, and limited workplace accommodations [26–29]. Another noted barrier to employment has been employer attitudes toward hiring and supporting individuals with disabilities [30–33]. While in general employers hold positive attitudes toward people with disabilities, when confronted with the process of hiring an individual with a disability many employers appear conflicted and reluctant to do so [32, 34], perceiving the costs as outweighing the benefits [35]. This belief may be underpinned by misconceptions or lack of knowledge regarding disability [36], such as the assumption that hiring individuals with a disability such as ASD, will incur higher costs due to poorer productivity [24]. Until this valid concern is addressed, it is likely that potential employers will continue to show reluctance in employing adults with ASD [37].

While the benefits and costs of both competitive and supported employment for adults with ASD has been examined from the perspective of the employee, taxpayer and society [13, 38–43], a paucity of literature attempts to describe this from the perspective of the employer [44]. In 2002, a cost-accounting methodology was developed by Cimera [45] identifying variables (e.g., supervision, employee turnover and worker's compensation claims) that are likely to influence employers' hiring decisions of both employees *with* and *without* disabilities. However, this methodology did not account for discrepancies in job position between employees [46]. To address this issue, Cimera [45, 46] proposed a "matched sample" framework whereby

Table 1. Characteristics of employers and organisations.

	<i>n</i>	%
Industry ¹		
Health care and social assistance	15	26.3
Retail trade	9	15.8
Education and training	6	10.5
Professional, scientific and technical services	5	8.8
Accommodation and food services	4	7.0
Manufacturing	4	7.0
Other services	4	7.0
Information, media and telecommunications	2	3.5
Rental, hiring and real estate	2	3.5
Public administration and safety	2	3.5
Other	4	7.0
Main client base ¹		
Local community	24	41.4
State-wide	16	27.6
Nationwide	11	19.0
International	7	12.1
Number of full-time employees ¹		
<5	10	19.2
6–10	4	7.7
11–20	8	15.4
20–100	14	26.9
>100	16	30.8

¹Excludes missing cases

<https://doi.org/10.1371/journal.pone.0177607.t001>

employees *with* and *without* disabilities are matched based on similar job titles, duties and responsibilities and then compared across work variables. For the purpose of this study the following work variables were of interest: workplace performance, supervision and training, and accommodations. Employer experiences of employing adults with ASD were also explored. Guided by Cimera's framework, the primary aim of this study was to objectively examine the benefits and costs of employing adults with ASD from the perspective of the employer.

Methods

Participants

A survey was distributed nationally to approximately 250 Australian organisations with 59 employers of adults with ASD completing it. From the sample, approximately 19% were from micro organisations (<5 employees), with 23% from small organisations (5–19 employees), and 57% from medium (20–199 employees) to large sized organisations (200+ employees) (Table 1). Fifty-one percent of organisations recruited employees with ASD through disability employment service (DES) providers, while 49% of organisations recruited independently. The industry distribution was broad, with health care and social assistance (26.3%), retail trade (15.8%) and education and training (10.5%) being most prevalent, and representative of the size and industry type of Australia generally [47].

Procedure

Recruitment of participants occurred via two pathways; 1) with the assistance of autism and not-for-profit disability organisations and DES providers, and 2) cold calling multiple businesses and organisations Australia-wide. The initial recruitment process depended heavily on the assistance from autism organisations and DES providers contacting their employer database listed as employing individuals with ASD. Many DES providers were reluctant to share employer details due to the sensitive nature of their relationship and concern for overloading an already time-poor population, resulting in a poor response rate over a 3-month period ($n = 12$). To accommodate for this low response rate, two additional research assistants were hired to begin cold calling businesses and organisations, which were selected based on the following criteria: a) industry and; b) business size, particularly large organisations (including number of additional locations). All respondents were invited to participate if they were employing at least one adult with ASD, who met the DSM-IV criteria for Asperger Syndrome (AS)/High Functioning Autism (HFA) only. Employees were required to be over the age of 18 years and working in open employment for a period of at least 6 months, in full-time, part-time or casual positions.

Prior to completing the survey, respondents were required to match their employee *with* ASD ($n = 59$) to two employees *without* ASD ($n = 96$). According to the "matched sample" methodology proposed by Cimera [37, 46], employees were matched on the basis of job similarity within the workplace (perform the same job duties, require the same skills and work capacity) and compared across cost-accounting variables (wages, hours worked per week, supervision, accommodations, and wage subsidies). This matched-sample approach enabled comparisons between the two groups as the employers reported on employees that they perceived as comparable, and ensured that the difference between the two groups were likely attributable to disability status rather than job responsibilities and skills. The chosen methodology also necessitated a reliance on employees declaring to their employers that they had AS/HFA. When a match could not be made between employees *with* and *without* ASD the survey was only completed for the employee with ASD. A post hoc power calculation indicated that a sample of the obtained size was adequate to identify moderate difference in the main outcomes between employees *with* and *without* ASD (effect size = 0.4), with 80% power and $\alpha = 0.05$.

Survey development

The survey addressed the work variables of interest in the following four categories: 1) employer characteristics, 2) employer experiences of employing an adult with ASD, 3) work conditions and, 4) employment costs. Development of the survey was informed by current research literature and consultation with representatives from disability employment service providers and researchers with experience in ASD. Following feedback on the survey from a reference group comprised of industry experts, employers of adults with ASD, employment co-ordinators from disability employment service providers and researchers, a full edited version of the survey was piloted with two employers of adults with ASD and finalised (S1 Appendix). The survey was administered online using the Qualtrics platform [48], with a paper version available on request and taking approximately 45 minutes to complete.

Data analysis

This study explored the perceived costs from the employers' perspective. The cost values were based on respondents' perceptions and estimates for the fiscal year 2015 in Australian dollars. Statistical analysis was conducted using the SAS version 9.2 software [49]. Descriptive statistics were used to summarise employer characteristics and experiences employing an adult with

ASD. Using ordinal regression and Chi-square statistics, work performance was compared between groups for 'above and below standard' versus 'meets standard performance'. Regression models were used to compare the cost-related variables including hourly wage (full-time and part-time employees were grouped respectively and calculated separately), weekly supervision costs, total weekly costs and training costs between employees *with* and *without* ASD. Correlations between responses from the same employer were taken into account as a random effect in the models (the SAS Mixed procedure).

The weekly cost to the employer for each employee was estimated as follows:

$$\text{Cost (\$AUS)} = (\text{hourly wage}) \times (\text{hours of work}) \times (1 - \text{subsidy proportion}) + (\text{cost of weekly supervision})$$

Following convention, a p-value <0.05 was taken to indicate a statistically significant association in all tests.

Ethical considerations

An information letter was sent to employers, briefly outlining the purpose of the study and inviting them to participate. Completed online or returned surveys were taken as consent to participate in the study. Ethical approval was obtained from the Curtin University Human Research Ethics Committee (HR37/2015) in Perth, Western Australia.

Results

Employer characteristics

Employment of adults with ASD. Forty-five percent of the organisations employed more than one employee with ASD, sixty percent had previously employed an adult with ASD, and more than three quarters had been employing adults with ASD for two or more years (Table 2). In approximately half of the organisations, the employee with ASD had been recruited through a DES provider.

Table 2. Current and previous employment of adults with ASD.

Factors	n	%
Number of employees with ASD in the organisation ¹		
1	29	54.7
2	6	11.3
3–5	11	20.8
>6	7	13.2
Organisations previously employing adult with ASD		
Yes	27	60.0
No	18	40.0
Number of years employing adult with ASD ¹		
<1	7	13.2
1–3	17	32.0
4–8	16	30.2
>9	13	24.5
Organisations recruiting employee with ASD through a disability employment service provider ¹		
Yes	26	51.0
No	25	49.0

¹Excludes missing cases

<https://doi.org/10.1371/journal.pone.0177607.t002>

Employer experience employing an adult with ASD

Employer experiences of employing an adult with ASD was considered in relation to workplace impact and workplace performance of the employee with ASD.

Impact in the workplace. Reasons for employing an adult with ASD. Participants reported several reasons for employing an adult with ASD within their organisations, (Table 3). Contact by an agency (e.g., DES provider), and/or a policy of corporate social responsibility accounted for fifty percent of organisations' responses, followed by the employee being the best candidate for the job at interview. Other reasons included the employee being previously known to the employer or the employee's family approaching the employer directly.

Interactions in the workplace. Over fifty percent of employers reported friendly mixed exchanges between employees *with* and *without* ASD, during both work and out of work conversations. In contrast, around one fifth reported that employees with ASD struggled with interacting with co-workers. Across this spectrum of diverse interactions employers reported relatively limited interaction, with a fifth of employees with ASD reportedly only interacting with a few co-workers, with slightly more than ten percent of conversations being solely work-related and/or restricted to daily greetings between co-workers (Table 4).

Impact of employee with ASD in the workplace. Overall, the impact of having an employee with ASD in the workplace was overwhelmingly positive (Table 5), particularly in regard to increasing awareness of ASD, and in promoting a culture of inclusion. Employees with ASD also contributed new creative and different skills to the work environment and positively impacted on workplace morale. Some of the less positive impacts of employees with ASD were the need for continuous supervision, instances of miscommunication with other employees and workplace conflict resulting from colleagues' lack of ASD specific knowledge and staff training. Despite some of these less positive impacts, no employers indicated that employing an adult with ASD resulted in reduced productivity.

Employer recommendation. The majority of employers reported that they would recommend employing an adult with ASD to a business associate, with very few responding that they would not do so. In addition, more than fifty percent of employers indicated they would employ another adult with ASD if the current employee with ASD left the workplace (Table 6).

Workplace performance. Employee requirements for workplace performance. Employees *with* and *without* ASD were compared on the extent to which they met standard requirements for good workplace performance. The responses indicated employees with ASD performed at an above standard level in regard to attention to detail, work ethic and quality of work (Table 7). However, employees with ASD performed at a below standard level in regard to flexibility and following instructions. Responses for completion of work tasks on time

Table 3. Reasons for employing adult with ASD in the organisation.

Reasons ^a	n	%
Employer contacted by an agency	19	32.2
Organisational policy of corporate social responsibility	12	20.3
Best candidate for the job at interview	9	15.3
Previously known to the employer	7	11.9
Employee with ASD approached the employer directly	7	11.9
Family inquiry made directly to employer	6	10.2
Other reasons	22	37.3

^aMultiple responses allowed

<https://doi.org/10.1371/journal.pone.0177607.t003>

Table 4. Interaction between the employee with ASD and co-workers.

Type of interaction ^a	n	%
Friendly mixed exchanges of both work and out of work conversations	33	55.9
Employees only interacts with a few of the other workers	12	20.3
Solely work-related conversations between workers	7	11.9
Restricted to greetings between workers	7	11.9
Employees struggles with interaction with other workers	11	18.6
Not applicable	3	5.1

^aMultiple responses allowed

<https://doi.org/10.1371/journal.pone.0177607.t004>

revealed an interesting pattern with employees with ASD more likely to perform both at above and below standard levels.

Standards of workplace performance. Employees *with* ASD had significantly better attention to detail in work tasks and in their work ethic compared to employees *without* ASD, however they were also significantly less flexible when completing work tasks. There were no significant differences between employees *with* and *without* ASD in their ability to follow instructions, their productivity and quality of work. Completing work on time yielded mixed results. While the majority of employees *without* ASD met the standard for completing work on time, there was a greater proportion of employees *with* ASD both above ($p < 0.0145$) and below standard ($p < 0.0417$) in their workplace, resulting in significant differences in both directions (Table 8).

Work conditions

Employees with and without ASD were grouped respectively into full-time or part-time employment and each group was analysed separately account for work basis differences. Comparison of work profiles and conditions for employees indicate that employees *with* ASD were more likely to be employed on a part-time basis than employees *without* ASD ($p < 0.0414$) (Table 9). No statistically significant differences between groups were found for level of supervision, modifications to the work environment or workplace training.

Table 5. Impact of having an employee with ASD in the workplace.

Impact ^a	n	%
Increased awareness regarding people with ASD in the workplace	35	59.3
Positive adaption in workplace culture to include and make the employee with autism feel part of the team	33	55.9
New creative and different skills have been brought to the workplace	19	32.2
Improvements in workplace morale	14	23.7
Lack of ASD-specific knowledge often leads to miscommunication between colleagues	7	11.9
Need for continuous workplace supervision of this employee has increased workload for other staff	10	16.9
Lack of ASD-specific staff training has resulted in an increase in workplace conflict between colleagues	5	8.5
Decreased productivity by the team	0	0.0
Other impacts	8	13.6
Not applicable	2	3.4

^aMultiple responses allowed

<https://doi.org/10.1371/journal.pone.0177607.t005>

Table 6. Employer opinions on employing an adult with ASD.

Factors	n	%
Employers who would recommend employing an employee with ASD		
Yes	39	66.1
No	2	3.4
Possibly	16	30.5
Replacement of employee with ASD if this person left the workplace		
Similar worker with ASD	31	52.5
Worker without ASD	5	8.5
Would not be replaced	4	6.8
Not sure	19	32.2

<https://doi.org/10.1371/journal.pone.0177607.t006>

Employment costs

Calculations of hourly wage for employees *with* and *without* ASD were based on the 112 employees with available data (Table 10). Hourly wages for employees *with* ASD was only marginally lower than those *without* ASD (difference of \$1.65). No significant differences between employees *with* and *without* ASD were evident in the weekly supervision cost, weekly cost to the employers (both full-time and part-time) and costs related to workplace training.

Table 7. Extent to which employees met requirements for good workplace performance.

Characteristics	Standard of work ¹		
	Above n(%) ²	Meets n(%) ²	Below n(%) ²
Flexibility			
No ASD	29 (30.2)	59 (61.5)	8 (8.3)
ASD	10 (19.6)	27 (52.9)	14 (27.5)
Attends to detail			
No ASD	18 (19.0)	67 (70.5)	10 (10.5)
ASD	28 (54.9)	19 (37.3)	4 (7.8)
Completes work on time			
No ASD	20 (21.30)	67 (71.3)	7 (7.5)
ASD	19 (37.3)	24 (47.1)	8 (15.7)
Follows instructions			
No ASD	28 (29.8)	62 (66.0)	4 (4.3)
ASD	14 (27.5)	30 (58.8)	7 (13.7)
Work ethic			
No ASD	28 (30.1)	58 (62.4)	7 (7.5)
ASD	36 (70.6)	12 (23.5)	3 (5.9)
Productivity			
No ASD	23 (24.5)	63 (67.0)	8 (8.5)
ASD	17 (34.0)	26 (52.0)	7 (14.0)
Quality of work			
No ASD	24 (25.9)	64 (68.8)	5 (5.4)
ASD	21 (41.2)	27 (52.9)	3 (5.9)

¹Excludes missing cases

² Percentages of responses within employee type.

<https://doi.org/10.1371/journal.pone.0177607.t007>

Table 8. Multinomial regression analysis of employees meeting requirements for good workplace performance^a.

Outcome	Employee	Odds ratio	95% confidence interval	p-value
Flexibility				
Below standard	No ASD	1 (reference)		
	ASD	3.82	1.43–10.20	0.0074
Above standard	No ASD	1 (reference)		
	ASD	0.75	0.32–1.77	0.5145
Attends to detail				
Below standard	No ASD	1 (reference)		
	ASD	1.41	0.40–5.01	0.5945
Above standard	No ASD	1 (reference)		
	ASD	5.49	2.51–11.98	<0.0001
Completes work on time				
Below standard	No ASD	1 (reference)		
	ASD	3.19	1.05–9.74	0.0417
Above standard	No ASD	1 (reference)		
	ASD	2.65	1.21–5.80	0.0145
Follows instructions				
Below standard	No ASD	1 (reference)		
	ASD	3.62	0.98–13.32	0.0532
Above standard	No ASD	1 (reference)		
	ASD	1.03	0.48–2.24	0.9340
Work ethic				
Below standard	No ASD	1 (reference)		
	ASD	2.07	0.47–9.18	0.3376
Above standard	No ASD	1 (reference)		
	ASD	6.21	2.81–13.75	<0.0001
Productivity				
Below standard	No ASD	1 (reference)		
	ASD	2.12	0.70–6.45	0.1853
Above standard	No ASD	1 (reference)		
	ASD	1.79	0.82–3.89	0.1409
Quality of work				
Below standard	No ASD	1 (reference)		
	ASD	1.42	0.32–6.38	0.6452
Above standard	No ASD	1 (reference)		
	ASD	2.07	0.99–4.34	0.0528

^aProportional odds not assumed

<https://doi.org/10.1371/journal.pone.0177607.t008>

Discussion

Understanding the impact of external factors influencing the employment of adults with ASD is imperative for closing the unemployment gap. One of the main external factors influencing employability is employer attitudes toward hiring people with a disability. The present study attempts to answer the fundamental question of whether hiring adults with ASD is a good business decision from the perspective of the employer by comparing the costs and benefits of employees *with* and *without* ASD.

Findings indicated that employees *with* ASD received a marginally lower hourly rate than their colleagues *without* ASD (difference \$1.65). This is likely attributable to the underemployment

Table 9. Variables used to calculate weekly costs.

Variable	No ASD	ASD	Total	Tests of association
Work basis				$p = 0.0414^1$
Full-time (FT)	42 (47.2)	14 (28.0)	56	
Part-time (PT)	21 (23.6)	22 (44.0)	43	
Casual	24 (27.0)	12 (24.0)	36	
Contract	2 (2.3)	2 (4.0)	4	
Missing	7 (7.3)	1 (2.0)	8	
Supervision required				$\chi^2_{(1)} = 3.3; p = 0.0680$
Yes	47 (49.0)	33 (64.7)	80	
No	49 (51.0)	18 (35.3)	67	
Modifications required				$p = 0.3745^1$
Yes	7 (7.3)	6 (11.8)	13	
No	89 (92.7)	45 (88.2)	134	
Training required				$\chi^2_{(1)} = 1.2; p = 0.2659$
Yes	53 (55.2)	33 (64.7)	86	
No	43 (44.8)	18 (35.30)	61	

¹p-value calculated using Fisher's Exact test

<https://doi.org/10.1371/journal.pone.0177607.t009>

of adults with ASD, who often work restricted weekly hours (<8 hours per week) or are in part-time roles, earning lower wages than employees *without* ASD [7, 16, 50]. In Australia, subsidies are widely available for employers employing individuals with a disability, including ASD, for financial assistance for payment of pro-rata wages, workplace modifications and services and as a financial incentive to ongoing employment [51]. It is likely that this lower hourly rate for employees with ASD is at least in part influenced by these subsidies. Although findings from this study have highlighted a gap in remuneration for employees with ASD they also indicated that while they may require some workplace modifications, supervision and training, there is no significant difference between them and their colleagues in regard to weekly employment, supervision and training costs. Previous research has suggested employer concerns related to hiring people with a disability are associated with increased costs for ongoing supervision, training and

Table 10. Comparison of employment costs for employees with and without ASD obtained from a random effects regression model.

Variable	Mean	95% confidence interval	p-value
Hourly wage			0.0248
No ASD	23.49	20.35–26.63	
ASD	21.84	18.61–25.07	
Weekly supervision cost			0.3373
No ASD	231.23	174.87–287.59	
ASD	255.76	198.26–313.26	
Weekly cost (full-time)			0.8916
No ASD	1033.10	836.41–1229.79	
ASD	1023.36	798.02–1248.70	
Weekly cost (part-time)			0.4436
No ASD	774.04	624.89–923.19	
ASD	734.06	593.45–874.68	
Cost of training			0.6362
No ASD	175.75	109.214.92	
ASD	184.21	116.85–251.56	

<https://doi.org/10.1371/journal.pone.0177607.t010>

accommodation [35, 37, 40]. Although this data needs to be interpreted with caution due to its sample size, these findings suggest that employers do not incur additional costs when employing an adult with ASD over and above that associated with any new employee.

Another employer concern is that of productivity and workplace performance of employees with disabilities. In this study, employees with ASD demonstrated above standard workplace performance when compared to their counterparts with regard to increased attention to detail, work ethic and quality of work. These outcomes point to qualities which are attractive to employers and common among people with ASD, such as reliability, integrity and consistent accuracy in performance [16, 22]. Findings from this study revealed that the employees *with* ASD were at least as productive as employees *without* ASD, challenging the assumption that hiring an individual with ASD, results in an employee with lack of work skills and reduced productivity [52, 53]. While recognising there are challenges associated with employing adults with ASD, such as following instructions, and flexibility and perseverating on work tasks [54], if not appropriately managed can potentially impact on productivity. Many of these challenges could be ameliorated by structuring and adapting work tasks, direct communication, and understanding individual support needs [19, 21, 55]. Should such strategies be implemented via approaches such as supervision, training and accommodations, our findings suggest that employers will incur no additional costs than any other employee, potentially reducing employer concerns of additional costs [56].

Favourable employer attitudes toward hiring individuals with disabilities is associated with larger (100+ employees) organisations and previous experience [36, 57]. Nearly a third of respondents in the current study were associated with large organisations suggesting that they were more likely to hire adults with ASD compared to medium or small organisations. This may be the result of large organisations having increased resources, less concern with the perceived "additional costs" for supervision, training and accommodations and an increased awareness and compliance with social corporate responsibility [36, 58]. Previous experience working with individuals with disabilities also positively influences future employment decisions [36], a finding supported in this study with 60% of respondents previously employing adults with ASD. Lastly, another factor contributing to favourable employer hiring decisions may be external support from a DES provider [36]. DES providers assist with recruitment, job placement, accommodations and ongoing support. Collaboration between employers and DES providers has been identified as a key component promoting positive employment outcomes for employees with a disability [33, 53, 59–61]. Fifty percent of respondents in this study were associated with and had recruited employees with ASD through a DES provider. These factors are likely to play an important role in successful employment of adults with ASD by reducing employers' potential prejudices [36].

Lastly, findings from this study point to some additional widespread organisational benefits of employing an adult *with* ASD, which are difficult to quantify. Employers indicated the positive impact employing an adult with ASD had on the workplace culture, particularly the addition of new and creative skills, the increase in ASD awareness and a conscious positive shift in workplace inclusion. A diverse and inclusive workplace where employees feel valued, plays a critical role in work performance, productivity and job success of employees with disabilities [62]. Diversity and inclusion is also beneficial to organisational success [30], offering a competitive edge in creativity, enhancing relationships with the community and improving job retention.

Limitations

There are several limitations to this study. Firstly, the relatively small sample size may not be completely representative of the broader population of employers of adults with ASD. Therefore, the cost component estimates may not reflect the general broader Australian

context. However, the main comparisons in this study was between employees *with* and *without* ASD under each employer, and while the absolute costs and experiences may differ between this sample and the broader population, it is likely that the relative differences between employees *with* and *without* ASD would be in the directions shown in this study. Secondly, given the complex nature of this research, recruitment of employers was particularly difficult. Of the 250 employers approached to participate in this study, only a quarter responded and results should be interpreted with caution. Respondents could well have been those who had the most positive experiences, thereby being more likely to participate in this study. It is possible that the results would have differed if non-responding employers have chosen to complete the survey. Another explanation may be that 51% of respondents are supported by DES providers and due to the nature of their supportive relationship and the financial assistance provided, may have felt pressured to respond positively. Thirdly, despite persistent follow-up calls and emails, many respondents failed to complete the survey. The 60% attrition rate observed may be explained by the survey length and time required to complete the survey for the targeted employers, a group of participants who are well-known for being time-poor. Attrition may also have been the result of respondents being supervisors or managers of employees with ASD without direct access to employment cost information. In many organisations, it is the responsibility of the Human Resources department to manage confidential employee information. Lastly, this study relied heavily on employees declaring to their employer that they had ASD (AS/HFA), with no direct means of verifying the accuracy of these self-reports. While demographic information for employees with ASD (age, gender, presence of intellectual disability, severity and educational level) may have strengthened the methodological framework, it was not collected as this study focused on employer perspectives of the skills, abilities and benefits that adults with ASD as employees bring to the workplace and not on the characteristics of the condition, and it is likely that the addition of further questions would have further impacted on the response rate.

Conclusions

Overall, this study found that employers do not incur additional costs when employing an adult with ASD over and above that associated with any new employee. Consequently, at the organisational level these results challenge employer attitudes that hiring adults with ASD may result in a loss of productivity and increased costs associated with workplace modifications and additional training and supervision. This study also identified the benefits of employing an adult with ASD such as significantly better attention to detail in work tasks and in their work ethic compared to employees *without* ASD. The addition of such strengths diversifies the workplace, potentially offering organisations a competitive edge [63]. Although this study may invite more questions, it is important that we continue to objectively address employer attitudes and concerns toward hiring and supporting employees with ASD, in order to improve their employment opportunities and strengthen and diversify the Australian workforce.

Supporting information

S1 Appendix. The benefits and costs to employers of employing an adult with High functioning autism survey.
(DOCX)

Acknowledgments

A special mention to Professor Patricia Howlin for her guidance and time in this paper. Thank you to Margaret Pickup and Shenara Fernando for their ongoing assistance and effort during

recruitment and data collection. Our sincere thanks go to the reference group comprised of industry experts, employers of adults with ASD, employment co-ordinators from disability employment service providers and researchers for their input and feedback in the development of the survey.

Author Contributions

Conceptualization: MS AJ DH SG TF MF.

Data curation: MS AJ DH RP.

Formal analysis: DH RP.

Funding acquisition: MS DH TF MF.

Investigation: AJ MS MF.

Methodology: MS AJ DH RP SG TF MF.

Project administration: MS AJ DH SG TF MF.

Supervision: DH SG TF MF.

Validation: MS AJ DH RP SG TF MF.

Visualization: MS DH SG MF.

Writing – original draft: MS AJ DH RP TF MF.

Writing – review & editing: MS DH RP SG MF.

References

1. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (4th ed, text rev.). Washington, DC: Author; 2000.
2. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (5th ed, text rev.). Arlington, VA: American Psychiatric Publishing; 2014.
3. Kenny L, Hattersley C, Molins B, Buckley C, Povey C, Pellicano E. Which terms should be used to describe autism? Perspectives from the UK autism community. *Autism*. 2016; 20(4):442–62. <https://doi.org/10.1177/1362361315588200> PMID: 26134030
4. Reform RGoW. A new system for better employment and social outcomes: Interim report. Canberra: Department of Social Services, 2014.
5. Capó LC. Autism, employment, and the role of occupational therapy. *Work*. 2001; 16:201–7. PMID: 12441449
6. Krieger B, Kinebarian A, Proding B, Heigl F. Becoming a member of the work force: perceptions of adults with Asperger Syndrome. *Work*. 2012; 43(2):141–57. <https://doi.org/10.3233/WOR-2012-1392> PMID: 22927626
7. Chen JL, Leader G, Sung C, Leahy M. Trends in Employment for Individuals with Autism Spectrum Disorder: a Review of the Research Literature. *Review Journal of Autism and Developmental Disorders*. 2015; 2(2):115–27.
8. Nations U. The Universal Declaration of Human Rights Paris, France: United Nations; 1948 [cited 2016 August].
9. Development OFEC-0a. *Sickness, disability and work: Breaking the barriers*. Paris: OECD, 2010.
10. ABS. ABoSC. *Autism in Australia, 2012 (Cat. no. 4428.0)*. Canberra: ABS, 2014.
11. ABS. ABoSC. *Disability, Ageing and Carers, Australia: Summary of Findings, 2012 (Cat. No. 4430.0)* Canberra: ABS; 2013.
12. Rosenblatt M. *I Exist: The Message from Adults with Autism in England*. London: National Autistic Society, 2008.

13. Mavranzouli I, Megnin-Viggars O, Cheema N, Howlin P, Baron-Cohen S, Pilling S. The cost-effectiveness of supported employment for adults with autism in the United Kingdom. *Autism*. 2013; 0(0):1–10.
14. Taylor J, Seltzer M. Employment and post-secondary educational activities for young adults with autism spectrum disorders during the transition to adulthood. *Journal of Autism & Developmental Disorders*. 2011; 41(5):566–74. Language: English. Entry Date: 20110624. Revision Date: 20120713. Publication Type: journal article.
15. Ballaban-Gil K, Rapin I, Tuchman R, Shinnar S. Longitudinal examination of the behavioral, language, and social changes in a population of adolescents and young adults with autistic disorder. *Pediatric Neurology*. 1996; 15(3):217–23. PMID: 8916159
16. Hendricks D. Employment and adults with autism spectrum disorders: Challenges and strategies for success. *Journal of Vocational Rehabilitation*. 2010; 32(2):125–34.
17. Muller E, Schuler A, Burton BA, Yates GB. Meeting the vocational support needs of individuals with Asperger syndrome and other autism spectrum disabilities. *Journal of Vocational Rehabilitation*. 2003; 18:163–75.
18. Baldwin S, Costley D, Warren A. Employment Activities and Experiences of Adults with High-Functioning Autism and Asperger's Disorder. *Journal of Autism and Developmental Disorders*. 2014; 44(5):1–12.
19. Hillier A, Campbell H., Mastriani K., Izzo M. V., Kool-Tucker A.K., Cherry L et al. Two-Year Evaluation of a Vocational Support Program for Adults on the Autism Spectrum. *Career Development for Exceptional Individuals*. 2007; 30(1):125–34.
20. Hurlbutt KC, Lynne. Employment and Adults with Asperger Syndrome. *Focus on Autism and Other Developmental Disabilities*. 2004; 19(4):215–22.
21. Hagner D, Cooney BF. "I do that for everybody": Supervising employees with autism. *Focus on Autism and Other Developmental Disabilities*. 2005; 20(2):91–7.
22. de Schipper E, Mahdi S, de Vries P, Granlund M, Holmann M, Karande S, et al. Functioning and disability in Autism Spectrum Disorder: A worldwide survey of experts. *Autism Research*. 2016; 00(00):1–11.
23. Olney MF. Working with autism and other social-communication disorders. *Journal of Rehabilitation*. 2000; 66(4):51–6 p. Language: English. Entry Date: 20050425. Revision Date: 20150820. Publication Type: Journal Article.
24. Graffam J, Smith K, Shinkfield A, Polzin U. Employer benefits and costs of employing a person with a disability. *Journal of Vocational Rehabilitation*. 2002; 17(4):251–63. Language: English. Entry Date: 20030801. Revision Date: 20091218. Publication Type: journal article.
25. Tse J. Employers' expectations and evaluation of the job performance of employees with intellectual disability. *Australia and New Zealand Journal of Developmental Disabilities*. 1994; 19(2):139–47.
26. Lopez B, Keenan L. Barriers to employment in autism: Future challenges to implementing the Adult Autism Strategy. *Autism Research Network*. 2014.
27. Lorenz T, Frischling C, Cuadros R, Heinitz K. Autism and Overcoming Job Barriers: Comparing Job-Related Barriers and Possible Solutions in and outside of Autism-Specific Employment. *PLoS ONE*. 2016; 11(1):e0147040. <https://doi.org/10.1371/journal.pone.0147040> PMID: 26766183
28. Hernandez B, Cometa MJ, Velcoff J, Rosen J, Schober D, Luna RD. Perspectives of people with disabilities on employment, vocational rehabilitation, and the Ticket to Work program. *Journal of Vocational Rehabilitation*. 2007; 27(3):191–201.
29. Scott M, Falkmer M, Girdler S, Falkmer T. Viewpoints on Factors for Successful Employment for Adults with Autism Spectrum Disorder. *PLoS One*. 2015; 10(10):e0139281. PubMed Central PMCID: PMC4603894. <https://doi.org/10.1371/journal.pone.0139281> PMID: 26462234
30. Unger DD. Employers' Attitudes Toward Persons with Disabilities in the Workforce: Myths or Realities? *Focus on Autism and Other Developmental Disabilities*. 2002; 17(1):2–10.
31. Kregel JT, Y. Employers' Attitudes toward Workers with Disabilities. *Journal of Vocational Rehabilitation*. 1994; 4(3):165–73.
32. Hernandez B, Keys C, Balcazar F. Employer attitudes toward workers with disabilities and their ADA employment rights: A literature review. *Journal of Rehabilitation*. 2000; 66(4):4–16.
33. Greenwood R, Johnson VA. EMPLOYER PERSPECTIVES ON WORKERS WITH DISABILITIES. *Journal of Rehabilitation*. 1987; 53(3):37–45.
34. Copeland J. The impact of disability in the workplace: An assessment of employer attitudes toward people with disabilities and the Americans with Disabilities Act. unpublished: Capella University; 2007.
35. Hernandez B, McDonald K. Exploring the Costs and Benefits of Workers with Disabilities. *Journal of Rehabilitation*. 2010; 76(3):15–23.

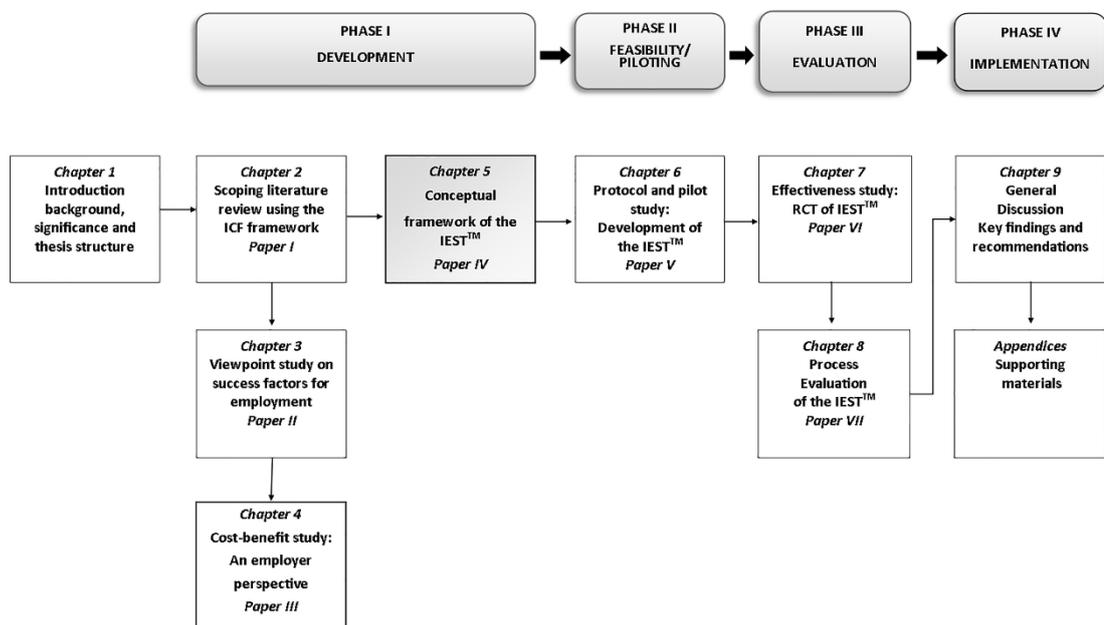
36. Ju S, Roberts E, Zhang D. Employer attitudes toward workers with disabilities: A review of research in the past decade. *Journal of Vocational Rehabilitation*. 2013; 38(2):113–23.
37. Cimera RE. The monetary benefits and costs of hiring supported employees: a pilot study. *Journal of Vocational Rehabilitation*. 2009; 30(2):111–9.
38. Järbrink K, McCrone P, Fombonne E, Zandén H, Knapp M. Cost-impact of young adults with high-functioning autistic spectrum disorder. *Research in Developmental Disabilities*. 2007; 28(1):94–104. <https://doi.org/10.1016/j.ridd.2005.11.002> PMID: 16551499
39. Cimera RE, Wehman P, West M, Burgess S. Do sheltered workshops enhance employment outcomes for adults with autism spectrum disorder? *Autism: the international journal of research and practice*. 2012; 16(1):87–94. 21610189.
40. Cimera RE, Cowan RJ. The costs of services and employment outcomes achieved by adults with autism in the US. *Autism*. 2009; 13(3):285–302. <https://doi.org/10.1177/1362361309103791> PMID: 19369389
41. Knapp M, Romeo R, Beecham J. Economic cost of autism in the UK. *Autism*. 2009; 13(3):317–36. <https://doi.org/10.1177/1362361309104246> PMID: 19369391
42. Schaller J, Yang NK. Competitive employment for people with autism: correlates of successful closure in competitive and supported employment. *Rehabilitation Counseling Bulletin*. 2005; 49(1):4–16. Language: English. Entry Date: 20051125. Revision Date: 20091218. Publication Type: Journal article.
43. Burgess S, Cimera RE. Employment Outcomes of Transition-Aged Adults With Autism Spectrum Disorders: A State of the States Report. *American Journal on Intellectual and Developmental Disabilities*. 2014; 119(1):64–83. <https://doi.org/10.1352/1944-7559-119.1.64> PMID: 24450322
44. Jacob A, Scott M, Falkmer M, &, Falkmer T. The Costs and Benefits of Employing an Adult with Autism Spectrum Disorder: A Systematic Review. *Plos One*. 2015; 10(10).
45. Cimera RE. The monetary benefits and costs of hiring supported employees: a primer. *Journal of Vocational Rehabilitation*. 2002; 17(1):23–32.
46. Cimera RE. The monetary benefits and costs of hiring supported employees: Revisited. *Journal of Vocational Rehabilitation*. 2006; 24(3):137–44.
47. Economist OotC. Canberra, ACT: Depart of Industry, Innovation and Science, 2015.
48. Qualtrics. Qualtrics Provo, Utah, USA2005 [cited 2015 May]. Available from: www.qualtrics.com.
49. SAS 9.2 [Internet]. SAS Institute Inc. 2008.
50. Eaves LC, Ho HH. Young adult outcome of autism spectrum disorders. *Journal of Autism and Developmental Disorders*. 2008; 38:739–47. <https://doi.org/10.1007/s10803-007-0441-x> PMID: 17764027
51. JobAccess. Subsidised wages for people with disability Department of Social Services2016 [cited July 2016]. Available from: <https://www.jobaccess.gov.au/employers/subsidised-wages-people-with-disability>.
52. Samorodov A. Indicators of cost-effectiveness of policy options for workers with disabilities. Geneva: International Labour Organization, 1996.
53. Smith K, Webber L, Graffam J, & Wilson C. Employer satisfaction with employees with a disability: Comparisons with other employees. *Journal of Vocational Rehabilitation*. 2004; 21(61–69).
54. Morgan RL, Schuitz JC. Towards an economical, multi-modal approach to increase employment for young adults with autism spectrum disorder. *Journal of Applied Rehabilitation Counseling*. 2012; 43(1):27–35 9p. Language: English. Entry Date: 20120504. Revision Date: 20150820. Publication Type: Journal Article.
55. Scott M, Falkmer M, Girdler G, &, Falkmer T. Viewpoints on factors for successful employment for adults with Autism Spectrum Disorder. *Plos One*. 2015; 10(10).
56. Burke J, Bezyak J, Fraser RT, Pete J, Ditchman N, Chan F. Employers' Attitudes Towards Hiring and Retaining People with Disabilities: A Review of the Literature. *The Australian Journal of Rehabilitation Counselling*. 2013; 19(1):21–38.
57. Kregel J, Tomiyasu Y. Employers' attitudes toward workers with disabilities. *Journal of Vocational Rehabilitation*. 1994; 4(3):165–73.
58. Responsibility ACICS. The 10th year-Progress and prospects for CSR in Australia and New Zealand: The state of CSR in Australia and New Zealand annual review 2014. Docklands, Victoria: Australian Centre for Corporate Social Responsibility, 2014.
59. Gilbride D, Stensrud R, Ehlers C, Evans E, Peterson C. Employers' attitudes toward hiring persons with disabilities and vocational rehabilitation services. *Journal of Rehabilitation*. 2000; 66(4):17–23.
60. Luecking RG. Emerging employer views of people with disabilities and the future of job development. *Journal of Vocational Rehabilitation*. 2008; 29(1):3–13. Language: English. Entry Date: 20081114. Revision Date: 20150819. Publication Type: Journal Article.

61. Fabian ES, Luecking RG, Tilson GP. EMPLOYMENT AND JOB PLACEMENT ISSUES—EMPLOYER AND REHABILITATION PERSONNEL PERSPECTIVES ON HIRING PERSONS WITH DISABILITIES—IMPLICATIONS FOR JOB DEVELOPMENT. *Journal of Rehabilitation*. 1995; 61(1):42–9.
62. Wehman P. Workplace inclusion: Persons with disabilities and coworkers working together. *Journal of Vocational Rehabilitation*. 2003; 18(2):131–41.
63. Kregel J. Why it pays to hire workers with developmental disabilities. *Focus on Autism and Other Developmental Disabilities*. 1999; 14(3):130–2.

Chapter 5: Paper IV-Conceptual framework of the IEST™

Preface

Chapter 5 describes the conceptual framework of three perspectives underpinning the development and evaluation of an autism-specific workplace tool for employers. The three perspectives included are self-efficacy from Bandura's social cognitive theory, the ICF framework in considering the environmental factors influencing employment outcomes, and a strengths-based approach of personal, intrinsic factors to individuals on the autism spectrum. This chapter ensures a strong theoretical underpinning is applied in the design, development and evaluation of the autism-specific workplace tool, providing a feasible and quality intervention.



Introduction

Employment occurs across diverse, complex and dynamic work settings, requiring individuals to flexibly navigate the physical and social environments to successfully participate in the workforce (1, 2). The elements involved in meeting the employment process criteria make finding and maintaining a job difficult for many adults on the autism spectrum (3), a condition characterised by experiencing difficulties in social interaction and communication, and those affected having restricted or repetitive behaviours (4). While the specific challenges experienced by adults on the autism spectrum in acquiring employment may vary, they commonly include: promoting themselves in an interview, adapting to changing job tasks and routines, planning, problem-solving and multiple tasking, communicating effectively and interacting socially (5-7). Poor employment outcomes cannot exclusively be attributed to autism-related traits (8, 9). A variety of external factors have been proposed as barriers to successful employment for adults on the autism spectrum, including the traditional job application and interviewing processes, limited workplace accommodations, a lack of autism-specific vocational support services and employer attitudes (10-14). Employer attitudes have the potential to influence work participation of individuals on the autism spectrum, playing a key role in the hiring decisions and supporting of prospective employees (15-17). In order to direct future research in improving employment outcomes, a comprehensive understanding of the associated work-related barriers need to be considered from both a personal and environmental perspective.

A paucity of literature currently addresses employment interventions for adults on the autism spectrum (18, 19). Current interventions have targeted the associated autism-related characteristics as a result of the continued challenges experienced by many individuals in finding and securing a job (4, 20). Several interventions used video modelling, role playing and behavioural and task management strategies, delivered through technology, simulation training or job coaches to teach the necessary social communication and vocational skills required in the workplace (21-26). While these interventions have been beneficial in improving outcomes, such as employment status, vocational skills, executive functioning and behaviour management (22, 27, 28), there has been a lack of consideration of the impact of environmental factors (29). One noted environmental factor are employers, who play a central role in the hiring and

supporting of individuals on the autism spectrum (15). Targeting employers and work environmental factors as a means in improving employment outcomes could significantly impact the design and delivery of services and interventions for individuals on the autism spectrum (17, 30). Implementing new approaches and strategies in disability management practices requires evidence-based research or needs assessments informing future organisational changes. Implementation science is one such approach, arguing for theory-based interventions that provide a foundation for understanding, designing, predicting and evaluating complex interventions and their associated processes (31, 32). Consequently, theoretical constructs have become increasingly recognised as integral in implementing practice changes and enhancing the development of interventions (33). This paper will consider the application of self-efficacy theory, the International Classification of Functioning, Disability and Health (ICF) framework and a strengths-based approach, broadly applied to the development and evaluation of an autism-specific workplace tool for employers. Self-efficacy theory was selected as it is considered an important determinant in human behaviour (34, 35), influencing self-knowledge and beliefs of self-determination (36, 37). The ICF was chosen for its biopsychosocial perspective in understanding functioning and disability, using the Core Sets for Autism Spectrum Disorder (ASD) to increase its utility and practicality (38, 39). The strengths-based approach was chosen as it identifies and fosters the skills and abilities of the individual (40). The three perspectives have underpinned the successful implementation of studies across a variety of disciplines, as presented in Table 5.1.

Table 5.1. Selected studies drawing from the theoretical constructs of self-efficacy, the ICF framework and the strengths-based approach

Perspective	Findings from studies drawing from theoretical constructs of self-efficacy, the ICF framework and the strengths-based approach
<i>Self-efficacy theory</i>	
Blackman & Chiveralls, (2011) (41)	Supervisor readiness to engage in vocational workplace rehabilitation of injured employees is reliant on their perceived self-efficacy in liaising and communicating with others involved in the process, managing finances and ensuring compliance
Fitzgerald & Schutte, 2010 (42)	Managers assigned to the intervention group were more likely to demonstrate transformational leadership in the workplace following an increase in their self-efficacy
Wood & Jacobson, 2008 (43)	An educational diabetes-related program increased supervisors' knowledge and understanding of the condition and their self-efficacy in supervising and improving work life for employees with diabetes
<i>ICF Framework: Environmental factors</i>	
Fleming et al., 2009 (44)	Using an environment-focused group intervention for adults with an acquired brain injury significantly improved their community integration in the domains of occupational and vocational activities and independent living
Foley et al., 2014 (45)	The physical environment was identified as an important factor influencing social participation of young adults with Down syndrome, with the potential to be modified to further increase participation
Heinemann et al., 2016 (46)	A measure of perceptions of barriers to the built and natural environment on health-related quality of life for people with disabilities was developed and evaluated as reliable and valid using the ICF framework
<i>Strengths-based approach</i>	
Campbell & Tincani, 2011, (47)	Children on the autism spectrum engaging in Power Card strategy intervention increased their direction following for the desired social behaviour. Power Card strategy uses a child's special interest as a motivator to target social skill behaviours
Steiner, 2011, (48)	A strengths-based approach to parent education for children on the autism spectrum improved parental statements about their child to be more positive, increased parental affect and physical affections towards their child

Application of self-efficacy theory

The concept of self-efficacy is a central tenet of Bandura's social-cognitive theory (35), being primarily associated with the role of personal cognitive factors in the triadic interaction between the person, their behaviour and the environment (49). Self-efficacy refers to an individual's confidence and belief in their ability to execute a task or manage a situation. Bandura argued self-efficacy as a principal determinant in human behaviour (34, 35), influencing self-knowledge and beliefs of self-determination (36, 37), such that an individual's ability to achieve success and avoid failure contributes significantly to their perception of control (50). Perceived self-efficacy is considered to be a powerful motivator, mediating the relationship between knowledge and action, by influencing the appraisal of personal capabilities, the behaviours pursued, and the effort expended on an activity (34). While the underlying skills acquired by an individual play a key role in their functioning, it is their perceived self-efficacy effecting their level of performance in any given situation. Higher levels of perceived self-efficacy are associated with higher performance attainments, influencing an individual's approach to complex and difficult tasks as a challenge to be mastered instead of avoided (37, 51).

In the case of prospective employers supporting individuals on the autism spectrum in the work environment, perceived self-efficacy is fundamental in changing attitudes and behaviours (34). Attitudes towards disability underpin employer beliefs and perceptions regarding autism in the workplace, determining their associated behaviour and management practices (14, 52, 53). Negative employer attitudes are often informed by misperceptions, a lack of knowledge and limited previous experience (15, 54, 55). Given that employers play a key role in the hiring decisions, implementing workplace accommodations and enforcing organisational policies and practices (30, 56), the development of an intervention drawing from the principles of self-efficacy theory is likely to be more effective in improving employer attitudes and behaviours, rather than targeting the support skills required. A growing body of evidence suggests that educational interventions are useful in enhancing self-efficacy (57-59), an approach that may be well-suited to employers.

Bandura described the development of self-efficacy as being grounded in four sources of information: 1) performance mastery; 2) vicarious experience; 3) verbal persuasion; and 4) physiological and affective states (34, 60). People's beliefs concerning their self-efficacy may arise from single or multiple sources, all with the potential to either strengthen or reduce efficacy beliefs (35).

Performance mastery

Performance mastery is considered the most influential source of efficacy based on authentic experiences of success. When people experience success self-efficacy beliefs are enhanced, while the experience of failure lowers beliefs, particularly if failure occurs before a strong sense of efficacy has been established (36, 60). While mastery experiences are grounded in life experiences, further development of self-efficacy involves individuals acquiring cognitive, behavioural and self-regulatory tools to manage their dynamic life circumstances (50). Once self-efficacy is established, it has the tendency to generalise to other situations, behaviours and environments (61, 62). Opportunities for performance mastery can have a particular utility in developing and improving employers' skills in modifying the work environment according to the unique needs of their employees on the autism spectrum (35).

Vicarious experience

Vicarious experiences influence self-efficacy through observing the modelled behaviours of others. Inferences are drawn based on an individual's social comparison of their capabilities in relation to those of others, particularly in relation to others who appear similarly competent (35, 60). Several factors can affect sensitivity of vicarious information including an individual's uncertainty of their capabilities; limited prior experience on which to base their personal competence on and the criteria by which their ability is evaluated, with most performance evaluated in terms of social criteria (60). While vicarious experiences are considered less effective than direct ones, they facilitate the learning of complex skills, enabling individuals to learn from the experiences of others (49). Modelled performances delivered by disability employment support services, or through tailored training sessions, may be useful in supporting employers' skills and behaviours required in engaging and interacting with employees on the autism spectrum (63, 64).

Verbal persuasion

Although a weaker form in enhancing self-efficacy beliefs in comparison to performance mastery and vicarious experience, verbal or social persuasion is also a means to enhance efficacy precepts through encouragement and evaluative feedback regarding an individual's ability to achieve goals and master specific tasks (35). However, the influence of persuasion and feedback is variable and often dependent on the individual's perception of the expertise, credibility and authority of the source (49, 60). Verbal persuasion may also facilitate sustained effort when individuals are confronted with barriers and self-doubt, encouraging experiences of success to be measured in terms of self-improvement, instead of triumphs over others (50). In the management and supporting of employees on the autism spectrum, verbal persuasion can have a particular utility in encouraging employers to set realistic goals, increasing the likelihood of success and efficacy beliefs (65, 66).

Physiological and affective states

Information gained through an individual's physiological and affective states can influence perceptions of self-efficacy in relation to personal resilience and ability to cope in stressful situations (35). When undertaking new or complex tasks the negative interpretation of such stressful and anxiety-provoking situations can elicit beliefs of poor performance, reinforcing feelings of inability and personal failure (49, 60). If these states and associated symptoms are managed, negative perceptions of self-efficacy can be reduced and reinterpretation of states can strengthen beliefs in performance (50). Addressing employers' perceived concerns prior to engaging in the process of employing someone on the autism spectrum is likely to assist in decreasing any associated anxieties, strengthening their efficacy beliefs in their management practices.

Application of the ICF Framework

Developed by World Health Organisation, the ICF is a conceptual framework providing a scientific basis and standardised language for coding and classifying health and health-related states (38). The ICF is based on the biopsychosocial model of functioning (67), which integrates the *medical model*, viewing disability as the individual's problem as a direct result of a health condition, focusing on seeking a cure or the individual's adjustment and behavioural change. While the *social model*, views disability as a socially created problem that can be resolved by

modifying the environment for full integration of the individual with a disability into society (38). The biopsychosocial approach recognises that functioning and disability is a complex interaction between several components within the ICF. First, *body functions and structures*, which describe the physiological functioning and anatomical parts of an individual, of which problems experienced are considered a significant deviation or loss and referred to as an ‘impairment’. Next, *activities and participation* which describe the execution of a task and involvement in a life event respectively, with difficulties experienced executing an activity described as ‘limitations’ and problems experienced in life situations as ‘restrictions’. Lastly, *contextual factors* include environmental factors comprising of the physical, social and attitudinal environment, and personal factors, i.e., features intrinsic to the individual, both of which act as either facilitators or barriers in functioning (68), as represented in Figure 5.1. Interactions between the components of the ICF are dynamic and bidirectional. When changes occur in one component, they have the potential to modify one or more other components (38).

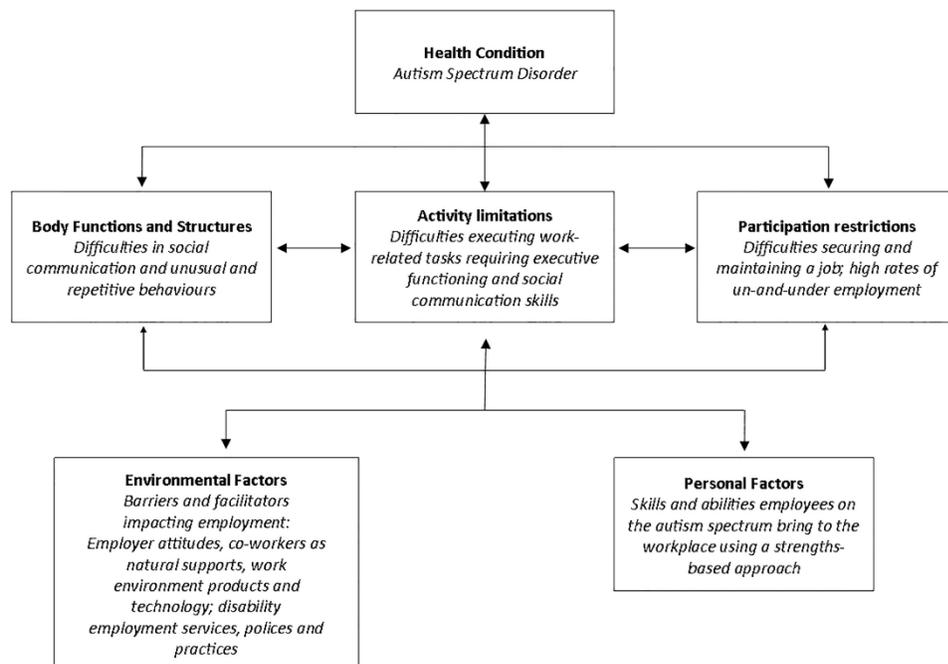


Figure 5.1. Possible interaction between the ICF components in relation to individuals on the autism spectrum and employment outcomes (38)

Using taxonomic principles and a hierarchical structure, the ICF organises four of the distinct components described above (i.e., *Body Functions and Structures*, *Activities and Participation* and *Environmental Factors*) into four levels consisting of chapters and categories of increasing detail. The first level of categorisation refers to the relevant chapters within the ICF, followed by the associated second, third and fourth level categories (38). For example, in the *Activities and Participation* classification these codes may relate to autism:

- d7 Interpersonal interactions and relationships
- d710 Basic interpersonal interactions
- d7104 Social cues in relationships
- d71040 Initiating social interactions

With more than 1,650 categories to describe an individual's functioning, using the ICF in its entirety is impractical and time consuming. To address this limitation, the development of ICF Core Sets emerged comprising of condensed categories particularly relevant to a specific health condition (69). Core Sets are utilised in the linking process of health-status measures, clinical measures and interventions to the ICF, providing advantages in designing an intervention (70). ICF Core Sets for ASD have recently been developed in response to the need for a standardised tool to describe functioning in ASD across the lifespan into adulthood (39, 71). Both *comprehensive* and *brief* versions of the Core Sets for ASD have been established. The *comprehensive* ICF Core Set for ASD includes 111 second-level ICF categories, one body structure, 20 body functions, 59 activities and participation categories, and 31 environmental factors. While the *brief* ICF Core Set for ASD is derived from the comprehensive version, it only includes the 60 categories most essential to describe the limitations in functioning (39, 69, 72). The ICF Core Sets for ASD can increase the utility of the ICF in better understanding participation in major life areas, including employment, specifically for individuals on the autism spectrum.

Environmental factors

'Environmental factors comprise the physical, social and attitudinal environment in which people live and conduct their lives' (68)^[p9]. The ICF organises environmental factors into five chapters each addressing different and relevant aspects of the environment, with the potential to influence employment outcomes for individuals on the autism spectrum (68). Environmental factors include the following chapters: 1) products and technology; 2) natural environment and

human-made changes to the environment; 3) support and relationships; 4) attitudes; and 5) services, systems and policies (Table 5.2) (38). While these factors are external to the individual on the autism spectrum, they are influential at both the *individual level* (immediate environment, such as the workplace including physical materials and features, employers, supervisors and co-workers), and *societal level* (formal and informal social structures, such as societal attitudes towards inclusive and diverse workplaces, disability employment service providers and organisational systems and policies). These external factors play an important role in either facilitating or hindering work participation for individuals on the autism spectrum (68, 73). An understanding of the integral role of environmental factors on an individual's functioning shifts the perspective in conceptualising disability, whereby disability is no longer a trait of the individual, but rather an outcome of the interaction between a person with a health condition (autism spectrum disorder) and the environment (workplace) (73). The use of the comprehensive ICF Core Sets for ASD, with the focus on 31 environmental factors will assist in recognising the impact of the environment on functioning, and will shift the focus of interventions from targeting individuals on the autism spectrum, to concentrating on the environment in which they participate.

Table 5.2 ICF environmental factors influencing employment outcomes for individuals on the autism spectrum

Environmental factors	Employment-related example	ICF Core Sets for ASD: Category codes
<i>Chapter 1: Products and technology</i>	The use of video modelling, virtual reality and simulation training, delivered via iPads, tablets and web-based applications assists in improving social interaction, communication and vocational skills required in the workplace for individuals on the autism spectrum. This is particularly effective in increasing the social-pragmatic skills essential to successfully participating in a job interview (23, 25, 74, 75)	e125; e130
<i>Chapter 2: Natural environment and human-made changes to the environment</i>	Recognising the impact of the natural work environment on participation for employees on the autism spectrum is important in identifying and reducing noise distractions and considering sensory needs (10, 76)	e240; e250
<i>Chapter 3: Support and relationships</i>	Employers and co-workers that provide practical physical and emotional support to employees on the autism spectrum assist in job retention. Support occurs through employers identifying workplace difficulties and adapting tasks, implementing workplace modifications and managing challenging behaviours according to the unique needs of the individual (3, 64, 77, 78)	e325; e330; e360
<i>Chapter 4: Attitudes</i>	Disability awareness training and education serve to provide employers with purposeful and specific information to increase their understanding of employing individuals on the autism spectrum in their workplace. Education is key in challenging misperceptions and associated negative employer attitudes towards autism in the workplace and improving employment opportunities (5, 11, 12, 79)	e430; e455; e460
<i>Chapter 5: Services, systems and policies</i>	Services, systems and policies play a critical role in meeting the employment support needs of individuals on the autism spectrum. Disability employment service providers need to tailor their support and knowledge to the specific workplace needs of employees on the autism spectrum, with effective systems and policies governing and advocating for inclusive practices in the processes of recruitment, hiring, retention and career advancement (2, 18, 30)	e590

Application of the strengths-based approach

While personal factors are considered a component of contextual factors, they are not classified within the ICF due to the many associated social and cultural variances (68). Personal factors are unique and intrinsic to the individual, comprising of features, such as age, gender, education, skills and abilities and past experiences (68). Individuals on the autism spectrum are

recognised for the many strengths they may bring to the workplace, performing well in jobs requiring systematic information processing, a high degree of visual accuracy, precision and repetition and increased concentration for prolonged periods of time (6, 77, 80). They also frequently possess qualities attractive to employers such as trustworthiness, honesty, reliability and low absenteeism (79, 81, 82). Given the complex interaction between personal factors and the individual's disability, a strengths-based approach is useful in understanding, harnessing and promoting the skills and abilities of individuals on the autism spectrum, encouraging their participation and integration in the workplace (83). A strengths-based approach capitalises on an individual's strengths and available resources, maximizing the person-job-environment fit, rather than counteracting their weaknesses (40, 84). Using a strengths-based approach alongside the ICF provides useful tools in framing the development of interventions from a contextual perspective.

Discussion

A complex intervention requires careful consideration of the many interacting components influencing its development, evaluation and implementation (85), particularly in regards to difficulties standardising the design, delivery of the intervention, the sensitivity of social and environmental context, the number of organisational levels targeted and the variability of outcomes (86, 87). Developing such an intervention requires a theoretical understanding of the likely process of change by drawing on the most appropriate available evidence and existing theories, frameworks and perspectives (87). A holistic approach enhances real-world feasibility of interventions, and the process of amalgamating theory, frameworks and approaches provides a comprehensive structure in addressing the development and evaluation of an autism-specific workplace tool for employers (Figure 5.2).

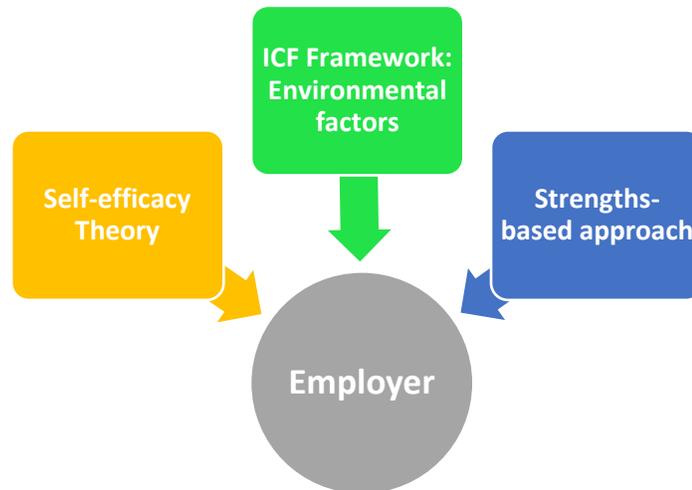


Figure 5.2. Integration of the theory, framework and approach in the development and evaluation of an employer-based intervention

The combination of constructs from self-efficacy theory, ICF environmental factors and a strength-based approach work together in addressing the needs of the employer at the individual and organisational level, empowering their ability to implement workplace changes. The constructs of self-efficacy applied through an education-based intervention will address employers' needs at an *individual level*, influencing their knowledge, attitudes, motivations and behaviours towards hiring and supporting employees on the autism spectrum (51). Interventions that increase knowledge increase self-efficacy, suggesting that employers with an increased sense of self-efficacy will be more confident and assertive in identifying and providing accommodations addressing the specific support needs of employees on the autism spectrum (88). In addition, employers with established efficacy beliefs will be empowered by their belief in their abilities when approaching and managing potentially challenging behaviours of employees on the autism spectrum, resolving workplace disputes and creating an inclusive culture and climate (30, 77).

At an *organisational level*, the dynamic interaction of contextual factors within the ICF can be utilised in the identification of barriers and facilitators impacting employer functioning. When implementing autism-related organisational changes, the ICF environmental factors highlight to employers the availability of resources within the workplace that are effective, easily

accessible, inexpensive, and time efficient in delivery (88). Access to, and the modification of, environmental factors by employers in supporting the needs of employees on the autism spectrum can include the use of natural supports, such as supervisors and co-workers (89), everyday technological devices (74, 90), job coaches and vocational support services (3, 5, 79), and policies and inclusive management practices influencing the workplace culture and attitudes (91). Personal factors associated with the ICF and the strengths-based approach are useful in recognising the skills, abilities and talents of employees on the autism spectrum which may influence their job performance. Subsequently, the strengths-based approach encourages employers to recognise, harness and capitalise on the unique, individual strengths of their employees, promoting opportunities for growth, development and integration in the workplace (40).

The advantage of applying more than a single perspective in the development and evaluation of an employer-based intervention is that constructs from one perspective complement and support others, providing a more balanced approach to practice. While an additional benefit of each of these perspectives is that it can be utilised and applied with different facets of an enquiry, this particular perspective has chosen to focus on the employer perspective. Given that the intervention focuses on modifying the work environment according to the unique needs of the autism population, it is essential, wherever possible, to collaborate with individuals on the autism spectrum to incorporate their valuable perspectives, knowledge and ideas in the development and evaluation processes (92).

Conclusion

This paper has considered three perspectives, which inform a holistic approach to a complex intervention developing and evaluating of an autism-specific workplace tool for employers. The incorporation of multiple perspectives strengthens the underpinnings of an intervention more than a single theory, framework or approach could. The perspectives underpinning the current study are important not only because of the lack of evidence-based research into employment interventions for individuals on the autism spectrum, but the lack of interventions considering the impact of the employer and work environment on work-related outcomes.

References

1. Shattuck PT, & Roux, A.M. Commentary on employment supports research. *Autism: The International Journal of Research & Practice*. 2015;19(2):246-7.
2. Nicholas D, Attridge, M., Zwaigenbaum, L., & Clarke, M. Vocational support approaches in autism spectrum disorder: A synthesis review of the literature. *Autism*. 2014.
3. Hendricks D. Employment and adults with autism spectrum disorders: Challenges and strategies for success. *Journal of Vocational Rehabilitation*. 2010;32(2):125-34.
4. American Psychiatric Association. *Diagnostic and statistical manual of mental disorders (5th ed, text rev.)*. Arlington, VA: American Psychiatric Publishing; 2013.
5. Müller E, Schuler, A., Burton, B. A., & Yates, G. B. Meeting the vocational support needs of individuals with Asperger syndrome and other autism spectrum disabilities. *Journal of Vocational Rehabilitation*. 2003;18:163-75.
6. Baldwin S, Costley, D., & Warren, A. Employment Activities and Experiences of Adults with High-Functioning Autism and Asperger's Disorder. *Journal of Autism and Developmental Disorders*. 2014;44(10):2440-9.
7. Hurlbutt K, & Chalmers, L. Employment and Adults with Asperger Syndrome. *Focus on Autism and Other Developmental Disabilities*. 2004;19(4):215-22.
8. Krieger B, Kinebanian, A., Prodinge, B., & Heigl, F. Becoming a member of the work force: perceptions of adults with Asperger Syndrome. *Work*. 2012;43(2):141-57.
9. Chen JL, Leader, G., Sung, C., & Leahy, M. Trends in Employment for Individuals with Autism Spectrum Disorder: a Review of the Research Literature. *Review Journal of Autism and Developmental Disorders*. 2015;2(2):115-27.
10. Lorenz T, Frischling C, Cuadros R, Heinitz K. Autism and Overcoming Job Barriers: Comparing Job-Related Barriers and Possible Solutions in and outside of Autism-Specific Employment. *PLoS ONE*. 2016;11(1):e0147040.
11. Lopez B, & Keenan, L. Barriers to employment in autism: Future challenges to implementing the Adult Autism Strategy. *Autism Research Network*; 2014.
12. Richards J. Examining the exclusion of employees with Asperger syndrome from the workplace. *Personnel Review*. 2012;41(5):630-46.
13. Shattuck PT, Roux, A., Hudson, L., Taylor, J., Maenner, M., & Trani, J. Services for Adults With an Autism Spectrum Disorder. *Canadian Journal of Psychiatry*. 2012;57(5):284-91.
14. Hernandez B, Keys C, Balcazar F. Employer attitudes toward workers with disabilities and their ADA employment rights: A literature review. *Journal of Rehabilitation*. 2000;66(4):4-16.
15. Unger DD. Employers' Attitudes Toward Persons with Disabilities in the Workforce: Myths or Realities? *Focus on Autism and Other Developmental Disabilities*. 2002;17(1):2-10.
16. Kregel J, & Tomiyasu, Y. Employers' attitudes toward workers with disabilities. *Journal of Vocational Rehabilitation*. 1994;4(3):165-73.
17. Ellenkamp J, Brouwers, E., Embregts, P., Joosen, M., & Weeghel, J. Work Environment-Related Factors in Obtaining and Maintaining Work in a Competitive Employment Setting for Employees with Intellectual Disabilities: A Systematic Review. *Journal of Occupational Rehabilitation*. 2016;26(1):56-69.
18. Howlin P, Arciuli J, Begeer S, Brock J, Clarke K, Costley D, et al. Research on adults with autism spectrum disorder: Roundtable report. *Journal of Intellectual & Developmental Disability*. 2015;40(4):388-93.
19. Schall CM, Wehman P, Brooke V, Graham C, McDonough J, Brooke A, et al. Employment Interventions for Individuals with ASD: The Relative Efficacy of Supported Employment With or

Without Prior Project SEARCH Training. *Journal of Autism and Developmental Disorders*. 2015;45(12):3990-4001.

20. Holwerda A, van der Klink, J. J., Groothoff, J. W., & Brouwer, S. Predictors for work participation in individuals with an Autism spectrum disorder: a systematic review. *J Occup Rehabil*. 2012;22(3):333-52.

21. Allen KD, Wallace DP, Renes D, Bowen SL, Burke RV. Use of video modeling to teach vocational skills to adolescents and young adults with autism spectrum disorders. *Education and Treatment of Children*. 2010;33(3):339-49.

22. Bonete S, Calero, M.D., & Fernandez-Parra, A. Group training in interpersonal problem-solving skills for workplace adaptation of adolescents and adults with Asperger syndrome: a preliminary study. *Autism*. 2015;19(4):409-20.

23. Gentry T, Kriner, R., Sima, A., McDonough, J., & Wehman, P. Reducing the Need for Personal Supports Among Workers with Autism Using an iPod Touch as an Assistive Technology: Delayed Randomized Control Trial. *Journal of Autism & Developmental Disorders*. 2015;45(3):669-84.

24. Hayes GR, Custodio VE, Haimson OL, Nguyen K, Ringland KE, Ulgado RR, et al. Mobile video modeling for employment interviews for individuals with autism. *Journal of Vocational Rehabilitation*. 2015;43(3):275-87.

25. Smith MJ, Ginger EJ, Wright K, Wright MA, Taylor JL, Humm LB, et al. Virtual Reality Job Interview Training in Adults with Autism Spectrum Disorder. *Journal of Autism and Developmental Disorders*. 2014;44(10):2450-63.

26. Liu KP, Wong D, Chung AC, Kwok N, Lam MK, Yuen CM, et al. Effectiveness of a workplace training programme in improving social, communication and emotional skills for adults with autism and intellectual disability in Hong Kong--a pilot study. *Occupational Therapy International*. 2013;20(4):198-204.

27. Schall CM. Positive behavior support: Supporting adults with autism spectrum disorders in the workplace. *Journal of Vocational Rehabilitation*. 2010;32:109-15.

28. Gilson C, & Carter, E. Promoting Social Interactions and Job Independence for College Students with Autism or Intellectual Disability: A Pilot Study. *Journal of Autism & Developmental Disorders*. 2016;46(11):3583-96.

29. Kirby AV, Baranek, G. T., & Fox, L. Longitudinal predictors of outcomes for adults with autism spectrum disorder: Systematic review. *OTJR Occupation, Participation and Health*. 2016;36(2):55-64.

30. Erickson WA, von Schrader, S., Bruyère, S.M., & VanLooy, S.A. The Employment Environment: Employer Perspectives, Policies, and Practices Regarding the Employment of Persons With Disabilities. *Rehabilitation Counseling Bulletin*. 2014;57(4):195-208.

31. May C. Towards a general theory of implementation. *Implementation Science*. 2013;8(1).

32. Nilsen P. Making sense of implementation theories, models and frameworks. *Implementation Science*. 2015;10(1).

33. Greenhalgh T, Robert, G. Macfarlane, F., Bate, P., & Kyriakidou, O. Diffusion of innovations in service organizations: Systematic review and recommendations. *Milbank Quarterly*. 2004;82(4):581-629.

34. Bandura A. Self-efficacy mechanism in human agency. *American Psychologist*. 1982;37(2):122-47.

35. Bandura A. Self-efficacy : the exercise of control / Albert Bandura. New York: W.H. Freeman & Co.; 1997.

36. Bandura A. Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*. 1977;84(2):191-215.
37. Bandura A. Exercise of personal agency through the self-efficacy mechanism. In: Schwarzer R, editor. *Self-efficacy: Thought control of action*. New York: Routledge; 2014. p. 3-38.
38. World Health Organization. *International Classification of Functioning, Disability and Health*. Geneva: WHO; 2001.
39. Bölte S, Mahdi, S., de Vries, P.J., Granlund, M., Robison, J., Shulman, C., Swedo, S., Tonge, B., Wong, V., Zwaigenbaum, L., Segerer, W., & Selb, M. *The Gestalt of Functioning in Autism Spectrum Disorder: Results of the International Conference to Develop Final Consensus ICF Core Sets*. 2017.
40. Russo RJ. Applying a strengths-based practice approach in working with people with developmental disabilities and their families. *Families in Society*. 1999;80(1):25-33.
41. Blackman I, & Chiveralls, K. Factors Influencing Workplace Supervisor Readiness to Engage in Workplace-Based Vocational Rehabilitation. *Journal of Occupational Rehabilitation*. 2011;21(4):537-46.
42. Fitzgerald S, & Schutte, N.S. Increasing transformational leadership through enhancing self-efficacy. *The Journal of Management Development*. 2010;29(5):495-505.
43. Wood F, G., & Jacobson, S. Educating Supervisors of Employees With Diabetes. *AAOHN Journal*. 2008;56(6):262-7.
44. Fleming J, Kuipers, P., Foster, M., Smith, S., & Doig, E. Evaluation of an outpatient, peer group intervention for people with acquired brain injury based on the ICF 'Environment' dimension. *Disability & Rehabilitation*. 2009;31(20):1666-75.
45. Foley K-R, Girdler S, Bourke J, Jacoby P, Llewellyn G, Einfeld S, et al. Influence of the Environment on Participation in Social Roles for Young Adults with Down Syndrome. *PLoS One*. 2014;9(9):e108413.
46. Heinemann A, Lai J-S, Wong A, Dashner J, Magasi S, Hahn E, et al. Using the ICF's environmental factors framework to develop an item bank measuring built and natural environmental features affecting persons with disabilities. *Quality of Life Research*. 2016;25(11):2775-86.
47. Campbell A, & Tincani, M. The Power Card Strategy: Strength-Based Intervention to Increase Direction Following of Children With Autism Spectrum Disorder. *Journal of Positive Behavior Interventions*. 2011;13(4):240-9.
48. Steiner AM. A Strength-Based Approach to Parent Education for Children With Autism. *Journal of Positive Behavior Interventions*. 2011;13(3):178-90.
49. Maddux JE. Self-efficacy theory: An introduction. In: Maddux JE, editor. *Self-efficacy, adaptation, and adjustment: Theory, research, and application*. New York: Plenum Press; 1995. p. 3-33.
50. Bandura A. *Self-efficacy in changing societies*. New York: Cambridge University Press; 1995.
51. Bandura A. Self-efficacy. In: Ramachandran VC, editor. *Encyclopedia of human behavior*. 4. New York. NY: Academic Press; 1994. p. 71-81.
52. Gilbride D, Stensrud, R., Ehlers, C., Evans, E., & Peterson, C. Employers' attitudes toward hiring persons with disabilities and vocational rehabilitation services. *Journal of Rehabilitation*. 2000;66(4):17-23.
53. Fraser R, Ajzen, I., Johnson, K., Hebert, J., & Chan, F. Understanding employers' hiring intention in relation to qualified workers with disabilities. *Journal of Vocational Rehabilitation*. 2011;35(1):1-11.

54. Ju S, Roberts, E., & Zhang, D. Employer attitudes toward workers with disabilities: A review of research in the past decade. *Journal of Vocational Rehabilitation*. 2013;38(2):113-23.
55. Livermore G, & Goodman, N. . A review of recent evaluation efforts associated with programs and policies designed to promote the employment of adults with disabilities. Ithaca, NY: Cornell University, Rehabilitation Research and Training Center on Employment Policy; 2009.
56. Gilbride D, Stensrud, R., Vandergoot, D., & Golden, K. Identification of the characteristics of work environments and employers open to hiring and accommodating people with disabilities. *Rehabilitation Counseling Bulletin*. 2003;46(3):130-90.
57. Daniali SS, Shahnaz, H., Kazemi, S., & Marzbani, E. The Effect of Educational Intervention on Knowledge and Self-efficacy for Pain Control in Patients with Multiple Sclerosis. *Materia Socio-Medica*. 2016;28(4):283-7.
58. Sepideh G, Tayebbeh, R., Mehran, B., & Hamidreza Behnam, V. Effect of a Supportive Educational Program on Self-Efficacy of Mothers with Epileptic Children. *Journal of Evidence-Based Care*. 2016;6(2):49-56.
59. Isaac C, Kaatz, A., Lee, B., & Carnes, M. An Educational Intervention Designed to Increase Women's Leadership Self-Efficacy. *CBE - Life Sciences Education*. 2012;11(3):307-22.
60. Bandura A. *Social foundations of thought and action: A social cognitive theory*. Engelwood Cliffs, NJ: Prentice-Hall; 1986.
61. Bandura A, Adams, N. E., & Beyer, J. Cognitive processes mediating behavioral change. *Journal of Personality and Social Psychology*. 1977;35(3):125-39.
62. Bandura A, & Adams, N. E. Analysis of self-efficacy theory of behavioral change. *Cognitive Therapy and Research*. 1977;1(4):287-310.
63. Unger DD. Workplace supports: A view from employers who have hired supported employees. *Focus on Autism and Other Developmental Disabilities*. 1999;14(3):167-79.
64. Howlin P, Alcock, J., & Burkin, C. An 8 year follow-up of a specialist supported employment service for high-ability adults with autism or Asperger syndrome. *Autism*. 2005;9:533-49.
65. Holman H, & Lorig, K. Perceived self-efficacy in self-management of chronic disease. In: Schwarzer R, editor. *Self-efficacy: Thought control of action*. New York: Routledge; 2014. p. 305-24.
66. Burckhardt CS. Educating patients: Self-management approaches. *Disability and Rehabilitation*. 2005;27(12):703-9.
67. Rauch A, Lückenkemper, M., & Cieza, A. . Introduction to the international classification of functioning, disability and health. In: Bickenbach JE, Cieza, A., Rauch, A., & Stucki, G, editor. *ICF Core Sets: Manual for clinical practice*. Göttingen: Hogrefe Publishing; 2012.
68. World Health Organization. *International Classification of Functioning, Disability and Health: Child and Youth version*. Geneva: WHO; 2007.
69. Cieza A, Ewert T, Berdirhan Üstün T, Chatterji S, Kostanjsek N, Stucki G. Development of ICF Core Sets for patients with chronic conditions. *Journal of Rehabilitation Medicine*. 2004;36(SUPPL. 44):9-11.
70. de Schipper E, Lundequist A, Coghill D, de Vries PJ, Granlund M, Holtmann M, et al. Ability and Disability in Autism Spectrum Disorder: A Systematic Literature Review Employing the International Classification of Functioning, Disability and Health-Children and Youth Version. *Autism research : Official Journal of the International Society for Autism Research*. 2015;8(6):782-94.

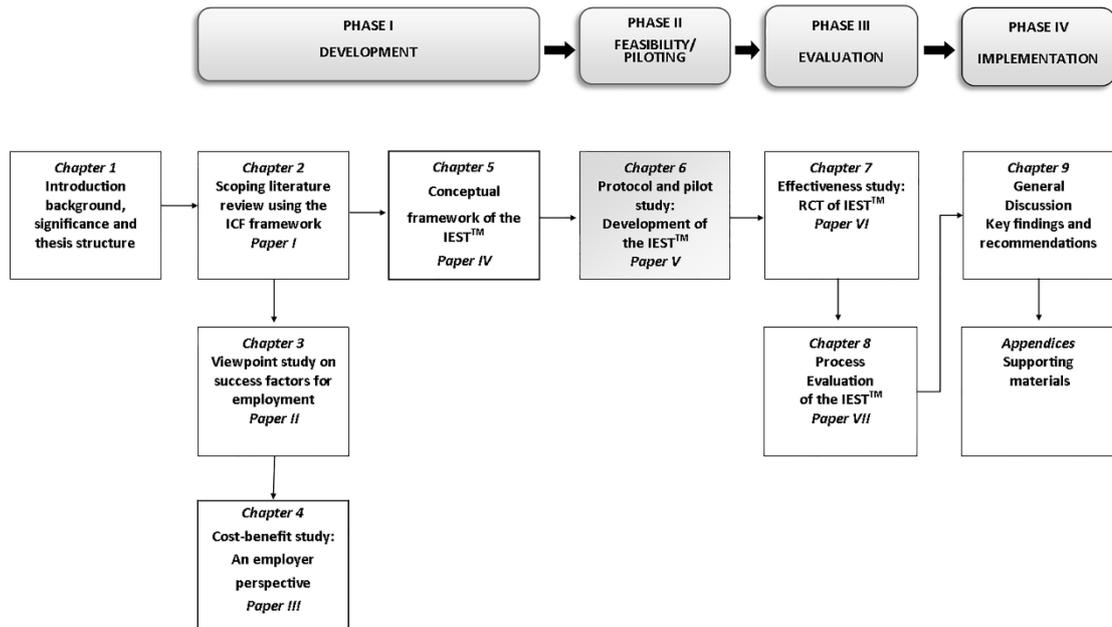
71. Bölte S, De Schipper E, Robison JE, Wong VCN, Selb M, Singhal N, et al. Classification of functioning and impairment: The development of ICF core sets for autism spectrum disorder. *Autism Research*. 2014;7(1):167-72.
72. Finger ME, Escorpizo R, Glassel A, Gmunder H P, Luckenkemper M, Chan C, et al. ICF core set for vocational rehabilitation: results of an international consensus conference. *Disability and Rehabilitation*. 2012;34(5):429-38.
73. Schneidert M, Hurst R, Miller J, & Ustun, Berdirhan. The role of Environment in the International Classification of Functioning, Disability and Health (ICF). *Disability and Rehabilitation*. 2003;25(11-12):588-95.
74. Kellems RO, & Morningstar, M.E. Using video modeling delivered through ipods to teach vocational tasks to young adults with autism spectrum disorders. *Career Development and Transition for Exceptional Individuals*. 2012;35(3):155-67.
75. Lattimore LP, Parsons, M.B., & Reid, D., H. Simulation training of community job skills for adults with autism: a further analysis. *Behavior Analysis in Practice*. 2008;1:24-9.
76. Tavassoli T, Miller, L. J., Schoen, S.A., Nielsen, D., & Baron-Cohen, S. Sensory over-responsivity in adults with autism spectrum conditions. *Autism*. 2014;18(4):428-32.
77. Hagner D, & Cooney, B. F. "I do that for everybody": Supervising employees with autism. *Focus on Autism and Other Developmental Disabilities*. 2005;20(2):91-7.
78. Wilczynski SM, Trammell B, Clarke LS. Improving employment outcomes among adolescents and adults on the autism spectrum. *Psychology in the Schools*. 2013;50(9):876-87.
79. Hillier A, Campbell, H., Mastriani, K., Izzo, M. V., Kool-Tucker, A.K., Cherry, L et al. Two-Year Evaluation of a Vocational Support Program for Adults on the Autism Spectrum. *Career Development for Exceptional Individuals*. 2007;30(1):125-34.
80. de Schipper E, Mahdi S, de Vries P, Granlund M, Holtmann M, Karande S, et al. Functioning and disability in autism spectrum disorder: A worldwide survey of experts. *Autism Research*. 2016;9(9):959-69.
81. Olney MF. Working with autism and other social-communication disorders. *Journal of Rehabilitation*. 2000;66(4):51-6.
82. Chown N, & Beavan, N. Intellectually capable but socially excluded? A review of the literature and research on students with autism in further education. *Journal of Further and Higher Education*. 2012;36(4):477-93.
83. Clifton DO, . & Harter, J.K. . Investing in strengths. Cameron KS, Dutton, J. E., & Quinn, R.E., editor. San Francisco: Berrett-Koehler; 2003.
84. Lorenz T, & Heinitz, K. Aspergers - Different, Not Less: Occupational Strengths and Job Interests of Individuals with Asperger's Syndrome. *Plos One*. 2014;9(6).
85. Kastner M, & Straus, S.E. Application of the Knowledge-to-Action and Medical Research Council frameworks in the development of an osteoporosis clinical decision support tool. *Journal of Clinical Epidemiology*. 2012;65(11):1163-70.
86. Craig P, Dieppe, P., Macintyre, S., Mitchie, S., Nazareth, I., & Petticrew, M. Developing and evaluating complex interventions: The new Medical Research Council guidance. *BMJ*. 2008;337(7676):979-83.
87. Medical Research Council. Developing and evaluating complex interventions: new guidance. 2008.
88. Unger D, & Kregel, J. Employers' knowledge and utilization of accommodations. *Work*. 2003;21(1):5-15.
89. Mank D, Cioffi, A., & Yovanoff, P. Analysis of the typicalness of supported employment jobs, natural supports, and wage and integration outcomes. *Mental Retardation*. 1997;35(3):185-97.

90. Burke RV, Allen, K.D., Howard, M.R., Downey, D., Matz, M. G., & Bowen, S.L. Tablet-based video modeling and prompting in the workplace for individuals with autism. *Journal of Vocational Rehabilitation*. 2013;38(1):1-14.
91. Wehman P. Workplace inclusion: persons with disabilities and coworkers working together. *Journal of Vocational Rehabilitation*. 2003;18(2):131-41.
92. Cooperative Research Centre for Living with Autism. Inclusive research practice guides and checklists for autism research: Version 2. Brisbane, Queensland: Autism CRC Ltd; 2016.

Chapter 6: Paper V-Protocol and Pilot study: Development of the IESTTM

Preface

Chapter 6 amalgamates the findings from the previous chapters, including the theoretical perspectives in the process of describing the development and features of the autism-specific workplace tool, the Integrated Employment Success Tool (IEST™). This is further informed through the piloting of the IEST™ providing formative and process feedback in relation to the changes to be made prior to evaluating the interventions' effectiveness.



This manuscript is currently under review. Due to copyright restrictions only, the **pre-print** version has been included in the thesis as a typescript. Please note, copyright remains with the journal.

Scott M, Girdler, S., Falkmer, T., & Falkmer, M. Development and evaluation of an autism-specific workplace tool for employers: A trial protocol. Evaluation and Planning 2018; Under review

Development and evaluation of the effectiveness of an autism-specific workplace tool for employers: A trial protocol

1

Abstract

Vocational interventions and support services have been effective in improving employment outcomes for individuals on the autism spectrum. The continued high rates of unemployment suggest that vocational interventions and support services alone are not sufficient, and that work-related environmental factors, such as employers' knowledge, confidence and skills in supporting individuals on the autism spectrum are likely to play a key role in improving outcomes. This paper describes a trial protocol for evaluating the Integrated Employment Success Tool (IEST™), an autism-specific tool designed to support employers of individuals on the autism spectrum. The IEST™ was developed using the Medical Research Council framework for complex interventions. The trial will randomly allocate employers supporting individuals on the autism spectrum to either the intervention (IEST™) group or control group, receiving employment support as usual. Participants allocated to the intervention group will be required to use the IEST™ in their workplace to modify the environment under real life employment conditions. Data will be collected online at baseline and post-test. The trial will be one of the first to examine the effectiveness of an autism-specific tool for employers, informing models of service delivery in this field.

¹ DES: Disability Employment Service; ESES: Employer Self-Efficacy Scale; ICF: International Classification of Functioning, Disability and Health; IEST™: Integrated Employment Success Tool; MPOC: Measure of Process of Care; MRC: Medical Research Council

Keywords

Autism spectrum disorder, employment, hiring, self-efficacy, vocational rehabilitation

workplace

Introduction

Individuals on the autism spectrum bring unique strengths and abilities to the workplace and often perform well in job tasks that require a high degree of accuracy in visual perception, systematic information processing and precise technical abilities (Baldwin, Costley, & Warren, 2014; de Schipper, et al., 2016). While the employment support needs of this group are diverse, given the right supports they can be successfully employed in a variety of competitive work environments (Hendricks, 2010; Mawhood & Howlin, 1999). For many individuals on the autism spectrum, the process of finding and securing a job is challenging, a process which results for many in unemployment. Even when individuals on the autism spectrum are employed, it is often in positions well below their education and skill level, working for fewer hours and earning less wages per week compared to those with other disabilities (Cimera & Cowan, 2009; Roux, Shattuck, Rast, Rava, & Anderson, 2015; Shattuck, et al., 2012). This may be attributed to the core characteristics that can be experienced including difficulties in social reciprocity and communication, and restricted or repetitive behaviours (American Psychiatric Association, 2013). While the individual difficulties experienced by people on the autism spectrum in obtaining a job may vary, many find it challenging to promote themselves in an interview, adjust to new work environments and routines, plan and manage a multi-task workload and respond to unexpected changes in the workplace (Baldwin, et al., 2014; Hagner & Cooney, 2005; Hillier, et al., 2007). Understanding the social norms and meeting the communication demands of the workplace may prove especially challenging (Hendricks, 2010). Workplace settings have a tendency to be complex, generally relying on self-management skills for navigation. These environments coupled with a pervasive lack of awareness and understanding in the workplace, and inadequate accommodations (Krieger, Kinebanian, Prodinger, & Heigl, 2012; Müller, Schuler, Burton, & Yates, 2003; Richards, 2012) underpin the

need for individualised vocational support for people on the autism spectrum (Migliore, Timmons, Butterworth, & Lugas, 2012).

Vocational support services are commonly used by individuals with a disability to facilitate the process of finding and securing a job (Lawer, Brusilovskiy, Salzer, & Mandell, 2009). Positive employment outcomes have been linked with a range of vocational supports, including matching the individual's skills and abilities to specific jobs, preparing for job interviews, providing on-the-job training, and implementing workplace accommodations (Hillier, et al., 2007; Howlin, Alcock, & Burkin, 2005; Migliore, Butterworth, & Zalewska, 2014; Nicholas, Attridge, Zwaigenbaum, & Clarke, 2014). With the goal of enhancing employment opportunities of individuals on the autism spectrum, increasing research has focused on the development and evaluation of employment interventions and programs. The majority of these interventions and programs target impairment or personal factors intrinsic to individuals on the autism spectrum, such as improving social interaction and communication, executive functioning, and self-determination, and behavioural management skills needed in the workplace (Allen, Wallace, Renes, Bowen, & Burke, 2010; Bonete, Calero, & Fernandez-Parra, 2015; Garcia-Villamizar & Hughes, 2007; Keel, Mesibov, & Woods, 1997; Strickland, Coles, & Southern, 2013). Despite these efforts, high rates of unemployment prevail for the autism population (Eaves & Ho, 2008; Holwerda, van der Klink, Groothoff, & Brouwer, 2012; Howlin, Goode, Hutton, & Rutter, 2004; Roux, et al., 2015). In Australia, the labour force participation rate is 42% for individuals on the autism spectrum, in comparison to 53% for all individuals with disabilities and 83% for individuals without disabilities (Australian Bureau of Statistics, 2014). This disappointing outcome indicates that vocational interventions and supports alone are not sufficient in achieving successful employment, suggesting that a key component in the employment process has been overlooked, namely, strategies to support employers' capability

to create inclusive work environments (Nicholas, et al., 2014; Rashid, Hodgetts, & Nicholas, 2017).

Employers play a critical role in facilitating or hindering the work participation of individuals on the autism spectrum, with their attitudes towards disability in the workplace well-recognised as influencing their hiring decisions (Greenwood & Johnson, 1987; Unger, 2002). Positive employer attitudes are associated with larger organisations, previous experience working with individuals with disabilities and the perceived benefits of retaining a qualified, reliable employee with low rates of absenteeism (Gilbride, Stensrud, Ehlers, Evans, & Peterson, 2000; Hartnett, Stuart, Thurman, Loy, & Batiste, 2011; Morgan & Alexander, 2005). In contrast, negative employer attitudes are influenced by a lack of knowledge regarding disability, misperceptions relating to the unknown additional costs associated with supervision, training and workplace accommodations and concerns over lost productivity (Cimera, 2009; Cimera & Cowan, 2009; Hernandez & McDonald, 2010). Given the potential capacity for employers to implement workplace modifications, lead workplace culture, diversify the workforce and implement organisational policies and practices, which remove barriers to work participation (Erickson, von Schrader, Bruyère, & VanLooy, 2014; Gilbride, Stensrud, Vandergoot, & Golden, 2003; Wehman, 2003), few studies have explored employer knowledge, skills and abilities (Hagner & Cooney, 2005; Unger, 2007).

To the authors' knowledge, no intervention exists specifically targeting employers hiring and supporting individuals on the autism spectrum. This paper presents a trial protocol for the development and evaluation of an autism-specific workplace tool for employers, the

Integrated Employment Success Tool (IEST™). The IEST™ aims to improve employment outcomes for individuals on the autism spectrum by enhancing employers' capability to create a work environment tailored to their employee's unique needs. To ensure fundamental components of this proposed trial are addressed, the principles of the SPIRIT guidelines for protocols are adhered to, which ensure high-quality conduct and reporting of clinical trials (Chan, et al., 2013). Further details relating to the Spirit 2013 Checklist can be found in Appendix A.

Objective of the trial

The primary objective for the trial is to evaluate the effectiveness of an autism-specific tool, the IEST™, in improving employers' self-efficacy and knowledge in modifying the work environment according to the specific needs of their employees on the autism spectrum. The primary research hypothesis is that employers using the IEST™ will demonstrate increased self-efficacy, as measured by the Employer Self-Efficacy Scale in modifying the work environment for employees on the autism spectrum. A secondary research hypothesis is that employers using the IEST™ will demonstrate more favourable attitudes towards disability in the workplace, as measured by the Scale of Attitudes Toward Workers with Disabilities.

Methods

Medical Research Council Framework

Complex interventions comprise of several interacting components, which influence their development, evaluation and replication (Kastner & Straus, 2012), particularly in relation to difficulties standardising the design, delivery of the intervention, the sensitivity of social and environmental context, the number of organisational levels targeted and the variability of outcomes (Craig, et al., 2008; Medical Research Council, 2008). The interaction of these

components make it difficult to determine what exactly is the 'active ingredient' in determining the effectiveness of an intervention (Medical Research Council, 2000). In response to these challenges, the Medical Research Council of the United Kingdom (MRC) has articulated an innovative framework designed to guide the development and evaluation of complex interventions, drawing from the best available evidence and appropriate theoretical frameworks (Medical Research Council, 2008). The MRC has recently been refined, applying a more flexible and less linear approach to the evaluation process (Campbell, et al., 2007), focusing more on development and piloting (Hardeman, et al., 2005). Given the multifaceted and dynamic nature of any work environment, and the context of organisational structures, climate and culture (Kirsh, 2000), developing an intervention targeting employers is challenging. With the goal of addressing these complexities under real-work conditions, the MRC framework was selected as the most appropriate to underpin the development and evaluation of the IEST™ intervention. The MRC framework is an iterative process, consisting of four phases: development, feasibility and piloting, evaluation and implementation (Medical Research Council, 2008).

Phase I: Development

Identifying the evidence base

As a first step in informing the development of the IEST™ the literature was examined to identify the priority areas in adult-based interventions addressing employment outcomes of people on the autism spectrum. Five systematic reviews were identified. Two reviews explored vocational supports including community-based job placements, the use of a job coach and technology and media-based support tools to enhance employment outcomes (Nicholas, et al., 2014; Taylor, et al., 2012). Another two reviews examined vocational training and the skills required to improve employment opportunities (Anderson, et al., 2017; Seaman & Cannella-

Malone, 2016). Vocational training targeted behavioural skills (including social interaction, adaptive and general skills) and self-management across the employment process. Video-based instruction and modelling were frequently used as vocational training tools. The final review broadly examined employment programs and interventions, highlighting the need for researchers to explore factors promoting success in workplace to inform the development of workplace supports and interventions (Hedley, et al., 2016). Overall, the findings from the systematic reviews indicated that employment interventions were targeted at improving individual's traits for employment success, with little consideration given to the impact of social and environmental factors influencing work participation (Scott, Falkmer, Girdler, & Falkmer, 2015).

To consolidate this evidence, a scoping review was conducted by the research team to examine the extent and range of literature relating to the employment of individuals on the autism spectrum, using the International Classification of Functioning, Health and Disability (ICF) framework to summarise and synthesise findings. Overall, 134 studies met the inclusion criteria, but only 36 focused on employment interventions and programs. These 36 studies were examined and meaningful concepts related to the target, modality and overall outcome of interventions were extracted for linkage to the ICF classification system using the recently developed ICF Core Sets for Autism Spectrum Disorder (Bölte, et al., 2017; Cieza, et al., 2005). The results revealed that the greatest contribution of meaningful concepts were categories within the *Activity and Participation* component, followed by categories within the *Environmental factors* and *Body functions and structures* components. These findings indicated that current interventions aimed at improving employment outcomes of individuals on the autism spectrum, specifically targeted the individual's behaviour, skills and autistic characteristics. Although environmental supports, through employers, technology, job

coaches, and accommodations were identified as useful, there was no published evidence of research evaluating the effectiveness of intervention targeting employers of individuals on the autism spectrum. This scoping review highlighted the need to understand the potential effectiveness of interventions developed specifically to support employers themselves in meeting the needs of their employees on the autism spectrum. Full findings of the scoping review are published elsewhere (Scott, et al., 2018).

Identifying and developing theory

Development of the IEST™ drew from three main perspectives, self-efficacy theory, the ICF framework and a strengths-based approach.

Self-efficacy theory

The concept of self-efficacy is a central tenet of Bandura's social-cognitive theory (Bandura, 1997), being primarily associated with the role of personal cognitive factors in the triadic interaction between the person, their behaviour and the environment (Maddux, 1995). Self-efficacy is defined as an individual's confidence and belief in their ability to execute a task or manage a situation. According to Bandura, self-efficacy is an important determinant in human behaviour (Bandura, 1982, 1997), influencing self-knowledge and beliefs of self-determination (Bandura, 1977, 2014), such that an individual's ability to achieve success and avoid failure contributes significantly to their perceptions of control (Bandura, 1995). Perceived self-efficacy is considered to be a powerful motivator, mediating the relationship between knowledge and action, by influencing the appraisal of personal capabilities, the behaviours pursued, and the effort expended on an activity (Bandura, 1982). Bandura describes four channels through which self-efficacy can be influenced: *performance mastery* achievements provide authentic evidence of an individual's ability to succeed; *vicarious experiences* influence self-efficacy through observation, modelling and social comparison with others; *verbal persuasion* is the

appraisal of skills and abilities by others; and *physiological and affective states* influence the perceptions of self-efficacy in relation to personal resilience and ability to cope in stressful situations (Bandura, 1982, 1997, 2014). While each channel has the potential to strengthen or reduce self-efficacy beliefs, it is performance mastery, or past experiences that is considered to be the most effective (Bandura, 1977, 1982, 1986; Maddux, 1995). While perceived self-efficacy is fundamental in changing behaviour, it is important to consider the role of environmental factors as facilitators or barriers external to the individual, which may affect their ability to perform the targeted behaviour (Bandura, 1997).

A growing body of evidence across a variety of fields suggests that educational interventions can enhance self-efficacy (Daniali, Shahnaz, Kazemi, & Marzbani, 2016; Isaac, Kaatz, Lee, & Carnes, 2012; Melville, et al., 2006; Sepideh, Tayebbeh, Mehran, & Hamidreza Behnam, 2016). Self-efficacy can be considered the mediator between knowledge and action (Bandura, 1986, 1997), and has been useful in predicting supervisors' readiness to engage in workplace vocational rehabilitation practices (Blackman & Chiveralls, 2011), improving organisational leadership to enhance workplace diversity (Combs, 2002), and developing an intervention to increase managers' transformational leadership (Fitzgerald & Schutte, 2010). Given the association between increased knowledge, increasing self-efficacy (Bandura, 1993), the IEST™ was developed to improve employers' knowledge and understanding of autism and this group's unique work-related needs. By using the IEST™ employers will be provided with opportunities for performance mastery in problem-solving workplace difficulties, and organising and implementing autism-specific strategies for successful employment.

The ICF framework

Understanding of the factors influencing the employment outcomes of individuals on the autism spectrum can be enhanced by the ICF framework. The ICF was developed by the World Health Organisation (WHO) and is based on a biopsychosocial perspective on health, providing a scientific basis and standardised language for coding and classifying health and health-related states (World Health Organization, 2001). Functioning and disability can be described as outcomes of the dynamic interaction between an individual's health condition (autism spectrum disorder) and the context (workplace) in which they find themselves (Schneidert, Hurst, Miller, & Ustun, 2003). Components of the ICF include: *body functions and structures*, *activity and participation*, and contextual components including *environmental* and *personal factors*. Environmental factors comprise the physical, social and attitudinal environments in which people live and conduct their lives. While these factors are external to the individual, they are influential at both the *individual level* (immediate environment, such as the workplace including physical materials and features, employers and co-workers), and *societal level* (formal and informal social structures, societal attitudes, services and systems), and play an important role in either facilitating or hindering work participation for individuals on the autism spectrum (Schneidert, et al., 2003; World Health Organization, 2007). The ICF framework has previously been used to understand functioning and disability across different contexts (Adolfsson & Simmeborn Fleischer, 2013; Foley, Dyke, Girdler, Bourke, & Leonard, 2012; Martins, 2015; Schreuer, 2009). Given the paucity of evidence on the impact of environmental factors on the work participation outcomes of individuals on the autism spectrum, the ICF provided a useful tool in framing the development of the IEST™.

Strengths-based approach

While personal factors are considered a component of contextual factors, they are not classified within the ICF due to the many associated social and cultural variances (World Health Organization, 2007). Given the many strengths that individuals on the autism spectrum bring to the workplace (Baldwin, et al., 2014), the development of the IEST™ required an approach that would promote an individual's strengths, while recognising and acknowledging their difficulties experienced. A strengths-based approach was considered useful in understanding, fostering and promoting the skills and abilities of individuals on the autism spectrum, encouraging their participation and integration in the workplace (Clifton & Harter, 2003). A strengths-based approach capitalises on an individual's strengths and available resources, rather than mitigating their weaknesses (Lorenz, Frischling, Cuadros, & Heinitz, 2016). Implementing a strengths-based approach alongside the ICF provided a comprehensive contextual perspective in the development of the IEST™.

Modelling process and outcomes

Interventions are strengthened by a development process which aims to comprehensively understand the needs of the target population (Medical Research Council, 2000). In developing the IEST™, in addition to appraising the published evidence and theoretical frameworks relating to employment in autism, two further studies were conducted. Firstly, Q methodology was employed to identify key factors for successful employment from both the viewpoints of adults on the autism spectrum and their employers, contrasting the similarities and differences in their views and how these viewpoints impact on the employment process (Scott, et al., 2015). Secondly, an online survey explored employers' perceptions of the costs and the benefits of hiring and supporting individuals on the autism spectrum (Scott, et al., 2017). Findings from these studies highlighted the potential utility of an intervention, which facilitated

effective communication between employees on the autism spectrum and their employers, adopted a strengths-based approach (Clifton & Harter, 2003), focused on the benefits that employees on the autism spectrum bring to the workplace, and was cost effective and simple to implement. These factors subsequently formed the intervention targets of the IEST™ which were to:

1. create an awareness of autism and highlight the strengths of employees on the autism spectrum;
2. assist employers and co-workers to identify potential *environmental* workplace difficulties for employees on the autism spectrum;
3. recommend the actions or modifications required to resolve environmental work difficulties;
4. facilitate a mutually beneficial relationship between employers and employees on the autism spectrum by fostering a mutual understanding of each other's strengths and workplace requirements; and,
5. improve employment outcomes including employee productivity, job retention and overall workplace success.

Development of the IEST™

Using the evidence-based objectives, the IEST™ intervention was developed by the candidate in consultation with an intervention team consisting of experts in autism. Feedback was provided by a community reference group throughout the development of the IEST™, comprising of adults on the autism spectrum, disability employment co-ordinators, practitioners and researchers. The reference group ensured that the IEST™ met the needs of employers hiring and supporting individuals on the autism spectrum. It also provided feedback

on the readability and format of the IEST™ and recommendations for refinement. Drawing from Bandura's self-efficacy theory (Bandura, 1977), the IEST™ utilises an educational intervention-based approach to enhance employers' confidence and skills to implement workplace modifications tailored to the needs of their employees on the autism spectrum. The intervention encourages employers to increase their knowledge about autism, empowering them to manage the physical, social and attitudinal environments in the workplace. Using the five established objectives, the IEST™-based strategies for employers were informed and developed according to the ICF environmental factors, including i) products and technology; ii) natural environment and human-made changes to environment; iii) supports and relationships; iv) attitudes; and v) services, systems and policies (World Health Organization, 2001), as shown in Table 1.

Table 1. Overview of the IEST™ based on intervention objectives using the ICF framework

Intervention objective	Intervention target according to the ICF Environmental factors	ICF category codes	IEST™ strategies
<i>Objective 1:</i> Create an awareness of autism and highlight the strengths of employees on the autism spectrum	Attitudes	e425; e430	Education for employers and co-workers regarding: <ul style="list-style-type: none"> • autism as a condition, including common characteristics, co-morbidities and aetiology • the identified strengths of individuals on the autism spectrum • understanding autism in the workplace • potential workplace difficulties
<i>Objective 2:</i> Assist employers and co-workers to identify potential <i>environmental</i> workplace difficulties for employees on the autism spectrum	Attitudes	e425; e430	Education for employers at an organisational level regarding inclusive workplace practices Education for employers regarding information explaining the support an employee on the autism spectrum may require at each phase of the employment process Checklists specifically designed to assist employers to recognise: <ul style="list-style-type: none"> • the potential and varying workplace difficulties an employee on the autism spectrum may encounter at each phase of the employment process • to consider how the associated workplace difficulties may influence the relevant support strategies provided
<i>Objective 3:</i> Recommend the actions or modifications required to resolve environmental work difficulties	Products and technology	e125 e130	Informing employers of technology, such as software programs or applications to assist in facilitating workplace communication Informing employers of products, software programs or applications to assist and educate employees on the autism spectrum with: <ul style="list-style-type: none"> • time management • organisation skills and prioritisation • multi-tasking • routine development • management
	Natural environment and human-made changes to environment	e240 e250	Strategies to modify the workplace according to light sensitivities: <ul style="list-style-type: none"> • positioning or structuring the work environment in areas of natural light versus fluorescent light • modifying fluorescent light to incandescent light Strategies to modify the workplace according to noise/sound sensitivities: <ul style="list-style-type: none"> • providing equipment, such as noise cancelling ear plugs and headphones • adapting the work environment including furniture, machinery and equipment to reduce noise or repetitive sounds • positioning the employee on the autism spectrum in a quieter, sensory appropriate work environment

Table 1. Continued

Intervention objective	Intervention target according to the ICF Environmental factors	ICF category codes	IEST™ strategies
<i>Objective 3:</i> Recommend the actions or modifications required to resolve environmental work difficulties	Supports and relationships	e325	Assigning a co-worker as a mentor (natural support) to coach and assist an employee on the autism spectrum to: <ul style="list-style-type: none"> • navigate everyday workplace practices (rules and regulations) • understand social norms and expectations • integrate into the workplace culture
		e330	Strategies for employers and co-workers to modifying the social work environment to assist with: <ul style="list-style-type: none"> • social behaviour • social interaction • communication (professional communication including task instructions, feedback and daily communication) • creating an inclusive workplace culture and climate
<i>Objective 4:</i> Facilitate a mutually beneficial relationship between employers and employees on the autism spectrum by fostering a mutual understanding of each other's strengths and workplace requirements	Supports and relationships	e330	Ongoing support provided by an employer assists in facilitating a mutually beneficial relationship by: <ul style="list-style-type: none"> • providing regular supervision and feedback sessions • modifying support strategies according to an employee's needs or as their workplace needs change over time • Focusing on an employee's strengths in the workplace instead of mitigating weaknesses promoting career development
<i>Objective 5:</i> Improve employment outcomes including employee productivity, job retention and overall workplace success	Support and relationships	e330	Strategies and resources to be implemented by employers to improve employee productivity, job retention and workplace success through: <ul style="list-style-type: none"> • creating an agreed upon and adjustable support plan • daily and weekly goal planners • graded priority planner handover plan for new supervisors in case of an emergency, sickness or annual leave •
	Services, systems and policies	e590	Resources referring and connecting employers to external support from a disability employment service provider to assist with: <ul style="list-style-type: none"> • disability awareness training • funding such as wage subsidies • assistance with implementing workplace modifications

Content of the IEST™

The IEST™ consists of eight modules containing autism-specific information, checklists and goal setting activities, workplace modification strategies and additional work-related resources. To ensure that employers are thoroughly equipped, the five modules specifically address each

phase of the employment process (Table 2). Phase 1 *'Advertising the job'* addresses the recruitment process and encourages employers to make simple adjustments when advertising the job to make the process of applying easier, clearer and more accessible for individuals on the autism spectrum. Phase 2 *'The interview'* is a critical step in securing a job and is often considered to be a stressful experience and significant barrier in the employment process for individuals on the autism spectrum (Higgins, Koch, Boughfman, & Vierstra, 2008; Strickland, et al., 2013). A job interview requires effective communication skills, social interaction and professional presentation from the interviewee (Smith, et al., 2014). To improve interview performance, this phase assists employers to modify the interview process and consider alternative options for assessing the candidate's skills and suitability for the job. Beginning a new job can be a confronting and unpredictable experience, particularly for individuals on the autism spectrum. To ensure employers are well-organised and prepared for their new employee Phase 3 *'Job commencement and placement'* assists with organising job expectations, productivity requirements, developing a support plan and appointing a supervisor or mentor as required. Phase 4 *'Workplace modifications'* provides employers with multiple strategies to adjust the work environment according to their employee's needs. This phase addresses the sensory, social, communication, activity and task and physical work environment. The process of maintaining a job is equally important as finding and securing it. Phase 5 *'Ongoing support'* highlights the necessary steps to assist employers in retaining and providing ongoing support to their employees through a process of ongoing re-assessment of workplace modifications.

Table 2 IEST™ manual overview

Module	Description
Introduction	Purpose of the IEST™ and instructions for its use
Information on autism	Understanding autism in the workplace
The employment process	The employment process explained
<i>Phase 1: Advertising the job</i>	Re-framing the recruitment process
<i>Phase 2: The interview</i>	Improving the interview performance of individuals on the autism spectrum
<i>Phase 3: Job commencement and placement</i>	Preparing your workplace for your newly hired employee on the autism spectrum
<i>Phase 4: Workplace modification</i>	Choosing the best and most appropriate strategies to modify the work environment
<i>Phase 5: Ongoing support</i>	Retaining your employee-ongoing and tailored support

Implementation of the IEST™

The IEST™ will be implemented in workplaces over a 12-week period. Employers allocated to the intervention group will be given the opportunity to choose between a paper-based or interactive PDF version of the intervention manual, as shown in Figure 1. Due to the unique and varying support needs of employees on the autism spectrum and vast differences likely to exist between work environments, employers are instructed to use those aspects of the IEST™ relevant to the needs of their employee on the autism spectrum and their workplace. Online video tutorials will be provided as supplemental material, guiding employers through the IEST™ manual. To begin using the IEST™ and modifying the work environment, participants are required to engage in the following process: identify what stage they are at in the employment process; evaluate the work environment; implement appropriate modification strategies; and re-evaluate the modified work environment. Throughout the 12-week trial period, participants will be encouraged to contact the research team with any support needs, questions and/or concerns relating to the use and implementation of the IEST™. The research team will respond to participant support needs via emails, phone calls or onsite visits, accordingly.

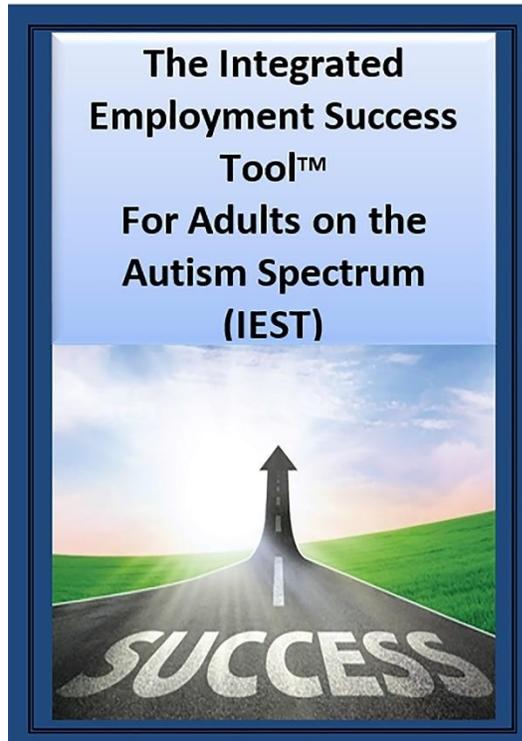


Figure. 1. IEST™ manual interactive PDF version

Phase II: Assessing feasibility and piloting

Testing procedures

A pilot study was conducted to test the feasibility of the IEST™ intervention and to provide formative and process feedback. Participants were recruited using convenience sampling and consisted of adults on the autism spectrum ($n=2$), employers ($n=4$), disability employment coordinators ($n=2$) and expert researchers in autism ($n=4$). Participants were provided with an electronic copy of the IEST to use it in their work environment for a period of 4 weeks.

Following the trial period, participants were asked to provide feedback on readability, design, content and usability of the IEST™ workplace tool.

While all participants acknowledged the usefulness of the IEST™ as an informative tool for employers, a variety of issues were identified in each of the feedback categories. *Readability* of

the document was compromised by issues of tautology, syntax and disability employment-related jargon, resulting in ambiguity and difficulty understanding the content, as well as lengthy paragraph structure and small font size. The overall *design* of the IEST™ was described as attractive, however two thirds of participants indicated that the layout between content, diagrams and images was cluttered and confusing, that there was a need for more employer checklists, and the primary use of the colour red was likely to be misinterpreted as indicating a warning, danger or anger. While most of participants acknowledged the challenge of developing *content* for a tool that needed to be both specific to autism and provide generalised accommodation strategies across work environments, the following improvements were suggested: including a rationale for the workplace strategies recommended followed by relatable and tangible examples, providing clear definitions of important concepts, and using ‘chunking strategies’, including grouping and organising concepts concisely to improve comprehension and retrieval of information. Lastly, the *usability* of the IEST™ was impacted by its length and format. Participants reported the IEST™ to be overwhelming in its detail, particularly for busy employers. It was proposed that an online version of the tool, which would enable a search function, would simplify the process for employers when seeking specific information appropriate to their employee on the autism spectrum’s circumstance. Based on the feedback from the pilot, the IEST™ was modified accordingly. While an online version of the tool may have been more accessible, efficient and user-friendly for employers, as a first step in developing the intervention, the IEST™ was converted into an interactive electronic document with the addition of online tutorials to guide employers using the tool in their workplace.

Estimating recruitment and retention of participants

Potential participants will be recruited Australia-wide through autism organisations, disability employment service (DES) providers, online advertisements using social media and community organisation websites, autism community forums and conferences. Recruitment will primarily occur through autism organisations and DES providers contacting employers registered in the databases as employing individuals on the autism spectrum. Eligible participants will be invited to participate by their employment coordinator. The names of those who are interested in participating will be provided to the candidate, who will screen and contact the participants directly to discuss the study further. Subsequently, employers will be recruited through online advertisements, community forums and conferences, and will be requested to register their interest in the trial directly with the candidate. Due to the dynamic and fluctuating nature of the workforce, participants will be recruited over a 12-15-month period. Participant retention will be monitored through regular contact with employers via telephone and email throughout the trial following their compliance and supporting their progress.

Participants

Inclusion criteria will be:

- employers living in Australia, with adequate English to read and comprehend the IEST™ manual;
- employers currently employing at least one adult on the autism spectrum;
- employees on the autism spectrum self-identifying as having Asperger's syndrome (AS), high functioning autism (HFA) or autism reportedly meeting the DSM-IV criteria for autism spectrum disorder (American Psychiatric Association, 2000); and,
- employees on the autism spectrum over the age of 18 years and working in open or supported paid employment in full-time, part-time or casual positions.

Determining sample size

Using Altman's nomogram equation, a power calculation was undertaken to determine the sample size. In order to identify a moderate to large effect size ($d=0.5-0.8$), with 80% power and a critical alpha value of 0.05, a total sample size of 80 ($n=40$ in each group) would be required (Altman, 1995). Given that the IEST™ has not yet been tested as an intervention, this sample size will allow for the expected 20% attrition rate that may occur throughout the trial.

Phase III: Evaluation

Assessing effectiveness

Design

In accordance with the CONSORT 2010 statement (Schulz, Altman, & Moher, 2010), a two-armed randomised controlled trial (RCT) will be undertaken to evaluate the effectiveness of the IEST™ intervention, an autism-specific workplace tool for adapting the work environment, in comparison to usual workplace supports for employers of individuals on the autism spectrum.

Randomisation

As participants register in the trial, using a simple randomisation technique (Kang, 2008), they will randomly be allocated to the IEST™ intervention group or control group. Participants will be assigned a unique identification number, which will be recorded onto a spreadsheet. While participants will be informed of the broader purpose of the trial improving employment outcomes for individuals on the autism spectrum, they will be blinded to both the hypotheses of the trial and their group allocation, reducing the risk for detection and performance bias. Additionally, to minimize contamination between groups, as new participants register into the trial and are identified to be from the same organisation or business as another participant (regardless of state, branch location, department and job title), they will automatically be

allocated to the same group. This approach will ensure that the control group does not inadvertently receive access or exposure to the intervention (Portney & Watkins, 2009).

Procedure

Data will be collected online via the Qualtrics platform (Qualtrics, 2005). Following randomisation, participants will be sent a survey link containing the questionnaires for the trial via email. Participant data collection will be collected at baseline (Time point 1) and at post-test 12-weeks later (Time point 2). On completion of baseline measures, participants in the intervention group will be sent a copy of the IEST™ to begin using in their work environment. The 12-week timeline will begin from intervention implementation. The control group's timeline will begin once baseline measures have been completed and will continue with the usual workplace support. It is anticipated that data collection at each time point will take no longer than 30 minutes to complete. At time point 2, participants will be given 2-3 weeks to complete the measures, receiving phone call and emails reminders as required. The schedule of enrolment, intervention and assessment of the trial is shown in Figure 2.

TIMEPOINT	STUDY PERIOD				
	Enrolment	Allocation	Post-allocation		Close-out
	$-t_1$	t_1	0 weeks	12 weeks	t_2
ENROLMENT:					
Eligibility screen	X				
Informed consent	X				
Allocation		X			
INTERVENTIONS:					
<i>Intervention Group:</i> <i>IEST™</i>			X	X	
<i>Control Group:</i> <i>Employment support as usual</i>			X	X	
ASSESSMENTS:					
<i>Sociodemographic questionnaire</i>		X			
<i>Employer Self-Efficacy Scale</i>		X			X
<i>Scale of Attitudes Toward Workers with Disabilities</i>		X			X

Figure. 2. Schedule of enrolment, intervention and assessments

Data collection

Sociodemographic characteristics. Data will be collected using a structured questionnaire including demographic information, vocational history and organisational characteristics. Demographic characteristics will be explored for any association with the primary and secondary outcome measures and to establish if randomisation resulted in comparable groups.

Primary outcome measure. Following a comprehensive literature review, no appropriate measures were deemed suitable to examine the specific constructs relating to employer self-efficacy in the content of modifying the work environment for individuals on the autism spectrum. Given that no available measure with established reliability and validity exists addressing the constructs relating to employer self-efficacy in supporting employees on the autism spectrum, the Employer Self-Efficacy Scale (ESES) has been purposefully developed for the trial (Bartholomew, Parcel, Kok, Gottlieb, & Fernandez, 2011; McBride, 2016). The development of the ESES is guided by the structure and characteristics of the Measure of Process of Care (MPOC). The MPOC was designed to assess parents' perceptions of the care provided to the children with a disability by health professional from rehabilitation centres (King, Rosenbaum, & King, 1995). It is a rigorously developed self-report measure that is comprehensive, user-friendly, easily administered and is responsive to the population's needs (King, et al., 1995). The MPOC's structure and design, along with its underlying concepts of providing general information and coordinated and comprehensive care aligned with the objectives of the ESES. The ESES consists of 20-items comprising five dimensions representing the employment process including recruitment, the interview, job placement and commencement, implementing workplace modifications and providing ongoing support. Each item is rated on a 10-point Likert scale ranging from '*not at all confident*' to '*completely confident*'. An overall score is calculated and a score for each of the five dimensions. A higher

total score indicates higher self-efficacy. Psychometric properties of the ESES including internal consistency and construct validity were established. A Cronbach alpha coefficient of 0.97 indicated excellent internal consistency. Attempted constructed validity occurred through expert review both internally with the research team and externally with the community reference group. It was further validated by piloting the ESES with the initial (N=12) pilot group who assessed the feasibility of the IEST™. Given that the reliability and validity for this measure is not yet known, the results will need to be interpreted with caution, with the aim of future studies validating this outcome measure.

Secondary outcome measure. Due to the lack of a 'gold-standard' outcome measures exploring employer attitudes towards employees on the autism spectrum (McConachie, et al., 2015), it is necessary to use a measure designed for the disability population in general. The Scale of Attitudes Toward Workers with Disabilities (SATWD) is a standardised tool used to quantify and measure employer attitudes towards employees with a disability in the workplace (Kregel & Tomiyasu, 1992). The SATWD consists of 25 items, rated on a 7-point (-3 to +3) Likert-type scale ranging from strongly disagree to strongly agree (Kregel & Tomiyasu, 1992). Participants are required to rate their level of agreement with each item based on their feelings towards and experiences with employees with disabilities. The scale was designed to minimize individual responses, with items placed at equal intervals. Ratings for each item are computed to provide an overall score. The absolute value of each rating was used as the measure of intensity for each item, as several of the items were negatively worded, indicating that an item could have a negative mean rating, yet suggesting a positive attitude towards disability in the workplace (Kregel & Tomiyasu, 1992). A higher total score indicates a more favourable positive attitude towards disability in the workplace. Weighted Cohen's Kappa scores ranging between 0.70- to 0.87 demonstrate high inter-rater reliability for the scale (Kregel & Tomiyasu, 1992).

Statistical analysis

Statistical analysis will be conducted using SPSS v24.0 (IMB Corporation, 2016). Baseline socio-demographic and experience of employing individuals on the autism spectrum of the two groups will be compared using frequency and chi-square analyses. Data will be examined for normality using the Kolmogorov-Smirnov test. Subject to normality results, the appropriate parametric or non-parametric tests will be used to analyse and compare within and between-group differences for total scores for the self-efficacy and employer attitude scales, respectively. Primary analysis will be conducted using an intention-to-treat approach with missing data carried forward and a secondary per-protocol analysis for participants who complete the trial. Following convention, a p -value <0.05 will be used to indicate statistical significance.

Ethical considerations

The proposed trial will be conducted in accordance with the ethical guidelines as described by the National Statement on Ethical Conduct in Human Research (Australian Government, 2007) and the Australian Code for Responsible Conduct of Research (National Health and Medical Research Council, 2007). Ethics approval to conduct this trial has been granted by the university's Human Research Ethics Committee and Autism Queensland and Autism Spectrum Australia (Aspect). Written informed consent will be obtained from all participants. Data collected from the trial will be de-identified and securely stored according to maintain the confidentiality and privacy of participants. The trial has also been registered with the Australia and New Zealand Clinical Trial Registry.

Understanding change process

While RCTs evaluate the effectiveness of an intervention, process evaluations are useful in exploring the quality of intervention implementation, causal mechanisms and assisting with

the interpretation of contextual factors influencing outcomes (Medical Research Council, 2015). Process evaluations are particularly useful in multisite trials, where the IEST™ may have been implemented and received differently across work environments (Oakley, Strange, Bonell, Allen, & Stephenson, 2006). The objectives of the process evaluation will be to describe fidelity and dosage of the IEST™; determine the barriers and facilitators impacting implementation; and explore recommendations for improvement.

The process evaluation will collect data both quantitatively and qualitatively (Oakley, et al., 2006). Quantitative data will be collected at the end of the trial using an online survey requesting participants to provide feedback on the IEST™. Data relating to the intervention group's frequency of use of the IEST™, overall satisfaction with the intervention, strengths and limitations experienced and recommendations for improvement will be obtained. Qualitative data obtained via semi-structured interviews will explore, in-depth, the experiences of participants using the IEST™ in their specific work environment. Interviews will be conducted via the telephone with participants following their completion of trial. An independent researcher, not involved with the trial phase of the project will conduct the interviews to reduce the risk of any potential bias. Interviews will be audio-recorded and transcribed verbatim. Data will be de-identified and transcripts exported into NVivo (NVivo, 2015) for thematic analysis using the constant comparative method (Glaser & Strauss, 1973). The candidate will also keep field notes for the duration of the RCT, documenting any incidents, additional feedback, ideas and assumptions in relation to the data.

Assessing cost-effectiveness

The IEST™ intervention is part of the adulthood program associated with a national autism research centre, which has guided its development and evaluation. Given employers' concerns

in relation to the unknown costs of providing workplace accommodations for employees on the autism spectrum (Hernandez & McDonald, 2010), the IEST™ was developed with the goal of being cost-effective, promoting workplace modifications likely to be beneficial to both employees with and without autism. The final IEST™ product will be made available to employers by the national autism research centre.

Phase IV: Implementation

Dissemination

At the completion of the trial participants allocated to the control group will be afforded the opportunity to use the IEST™ in their respective workplace, if it demonstrates to be effective in achieving the trial objectives. The national autism research centre will determine the broader dissemination plan.

Surveillance and monitoring

Follow-up of participants will occur at six and 18-months post-trial. Informed consent has been obtained allowing future contact to assess outcomes over time.

Long term follow-up

Data collected from this study will be used to meet the broader objectives and milestones of the national autism research centre, relating to increased community participation, employment retention and overall improved quality of life of individuals on the autism spectrum.

Discussion

Successful employment for individuals on the autism spectrum is often a complex process, requiring broader consideration than just the personal intrinsic factors impacting the process of finding and securing a job. To date, research and models of service delivery have overlooked

the importance of factors extrinsic to the individual in promoting successful outcomes, including approaches which target the social, physical and attitudinal aspects of work environments (Holwerda, et al., 2012; Kirby, Baranek, & Fox, 2016), and increase the knowledge of employers and co-workers about autism. The extrinsic focus of the IEST™ is unique, being one of the first employment-based interventions aimed at empowering employers to modify the workplace in ways which facilitate the inclusion of individuals on the autism spectrum.

The employment support needs of individuals on the autism spectrum are unique and diverse compared to the needs of the general disability population, requiring supports and approaches targeted at meeting the needs of individuals, rather than the group (Richards, 2012). In the absence of evidence-based interventions many businesses and autism organisations have developed their own manuals and tools to assist them in supporting employees on the autism spectrum in the workplace. While these tools may be helpful, they are not necessarily underpinned by a theoretical framework, evidence-based, nor have they been systematically evaluated. To the authors' knowledge, the IEST™ will be one of the first workplace tools targeting employers that will be empirically and rigorously evaluated.

Employers are often concerned with costs of providing accommodations in the workplace. Positive findings from the trial will indicate that not only if the IEST™ is useful in assisting employers to implement autism-specific workplace modifications, but will also provide an understanding of its cost effectiveness. Accommodations that are reasonable and affordable are more likely to be implemented by employers (Gilbride, et al., 2000), with many potential

benefits, including retention of qualified employees, increasing productivity and profitability, reducing the turnover of employees and fostering an inclusive workplace culture and climate (Hartnett, et al., 2011; Unger & Kregel, 2003). Many of the accommodations made for employees with a disability are also beneficial to workers without a disability (Hartnett, et al., 2011). The employment of workers on the autism spectrum creates the opportunity not only for will new and creative skills in the workplace, but fosters a greater awareness of autism and a shift towards inclusion and diversity in the workforce (Scott, et al., 2017), offering employers a competitive edge (Unger, 2002). The IEST™ may also have positive implications for vocational support services that often have limited availability and funding to support individual employees and employers. The IEST™ may provide a tool that vocational services can give to employers to support them between their regular worksite visits, reducing employers' dependency on external supports. The IEST™ has been developed as part of the Autism CRC's initiative to improve the employment opportunities for individuals on the autism spectrum to find a place in society. The objectives of the IEST™ are also in line with a major Australian Federal Government priority to increase labour force participation for Australians with a disability as outlined in the National Disability Strategy 2010-2020 (Council of Australian Governments, 2010).

Conclusion

While vocational interventions and support services have been effective in improving employment outcomes for individuals on the autism spectrum, strategies to develop employers' capability to assist in this matter have been overlooked. The IEST™ is one of the first employment-based interventions to be trialed, aimed at empowering employers' knowledge, skills and abilities to modify the workplace for individuals on the autism spectrum.

Acknowledgements

A special mention and thank you to Emeritus Professor Sylvia Rodger AM, who guided the development and refinement of the IEST™, with the goal of always improving the lives of those on the autism spectrum. Our sincere thanks go to the reference group and pilot participants comprised of industry experts, employers of adults with ASD, employment co-ordinators from AIM Employment of the Autism Association of Western Australia, and researchers for their input and feedback in the development of the IEST™.

Funding

The authors acknowledge the financial support of the Cooperative Research Centre for Living with Autism (Autism CRC), established and supported under the Australian Government's Cooperative Research Centres Program. The authors acknowledge the financial support of the Australian Postgraduate Award Scholarship. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript

Availability of data and materials

Data collected and analysed in this trial will not be publicly available due to ethical reasons. This project has not been granted ethics to release the data publicly as it would compromise the confidentiality of the participants and the sensitive nature of the data collected regarding their businesses, companies and organisations. However, data requests for additional information on these restrictions may be directed to Wendy Jacobs (Ethics Support Office- Health Sciences, Research Integrity, Office of Research and Development, email: ORD-ethics@curtin.edu.au)

References

- Adolfsson, M. & Simmeborn Fleischer, A. 2013. Applying the ICF to identify requirements for students with Asperger syndrome in higher education. *Dev Neurorehabil.*
- Allen, K.D., Wallace, D.P., Renes, D., Bowen, S.L., & Burke, R.V. 2010. Use of video modeling to teach vocational skills to adolescents and young adults with autism spectrum disorders. *Education and Treatment of Children, 33*, 339-349.
- Altman, D. 1995. *Practical statistics for medical research*. Chapman & Hall, London.
- American Psychiatric Association. 2000. *Diagnostic and statistical manual of mental disorders (4th ed, text rev.)*. American Psychiatric Association, Washington, DC.
- American Psychiatric Association. 2013. *Diagnostic and statistical manual of mental disorders (5th ed, text rev.)*. American Psychiatric Publishing, Arlington, VA.
- Anderson, A., Moore, D.W., Rausa, V.C., Finkelstein, S., Pearl, S., & Stevenson, M. 2017. A Systematic Review of Interventions for Adults with Autism Spectrum Disorder to Promote Employment. *Review Journal of Autism and Developmental Disorders, 4*, 26-38.
- Australian Bureau of Statistics, 2014. Autism in Australia 2012 Publishing, Canberra.
- Australian Government, 2007. National Statement on Ethical Conduct in Human Research, Publishing, Canberra, ACT.
- Baldwin, S., Costley, D., & Warren, A. 2014. Employment Activities and Experiences of Adults with High-Functioning Autism and Asperger's Disorder. *Journal of Autism and Developmental Disorders, 44*, 2440-2449.
- Bandura, A. 1977. Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*, 191-215.
- Bandura, A. 1982. Self-efficacy mechanism in human agency. *American Psychologist, 37*, 122-147.
- Bandura, A. 1986. *Social foundations of thought and action: A social cognitive theory*. Prentice-Hall, Engelwood Cliffs, NJ.
- Bandura, A. 1993. Perceived self-efficacy in cognitive development and functioning. *Educational Psychologist, 28*, 117-148.
- Bandura, A. 1995. *Self-efficacy in changing societies*. Cambridge University Press, New York.
- Bandura, A. 1997. *Self-efficacy : the exercise of control / Albert Bandura*. W.H. Freeman & Co., New York.
- Bandura, A., 2014. Exercise of personal agency through the self-efficacy mechanism, in: Schwarzer, R. (Ed.), *Self-efficacy: Thought control of action*, Publishing, New York, pp. 3-38.
- Bartholomew, L.K., Parcel, G.S., Kok, G., Gottlieb, N.H., & Fernandez, M.E. 2011. *Planning health promotion programs: an intervention mapping approach*. Wiley, San Francisco.
- Blackman, I. & Chiveralls, K. 2011. Factors Influencing Workplace Supervisor Readiness to Engage in Workplace-Based Vocational Rehabilitation. *Journal of Occupational Rehabilitation, 21*, 537-546.
- Bölte, S., Mahdi, S., de Vries, P.J., Granlund, M., Robison, J., Shulman, C., Swedo, S., Tonge, B., Wong, V., Zwaigenbaum, L., Segerer, W., & Selb, M., 2017. The Gestalt of Functioning in Autism Spectrum Disorder: Results of the International Conference to Develop Final Consensus ICF Core Sets, Publishing, Manuscript submitted for publication.

- Bonete, S., Calero, M., & Fernandez-Parra, A. 2015. Group training in interpersonal problem-solving skills for workplace adaptation of adolescents and adults with Asperger syndrome: a preliminary study. *Autism, 19*, 409-420.
- Campbell, N.C., Murray, E., Darbyshire, J., Emery, J., Farmer, A., Griffiths, F., Guthrie, B., Lester, H., Wilson, P., & Kinmonth, A.L. 2007. Designing and evaluating complex interventions to improve health care. *BMJ, 334*, 455.
- Chan, A.W., Tetzlaff, J.M., Gøtzsche, P.C., Altman, D.G., Mann, H., Berlin, J.A., Dickersin, K., Hróbjartsson, A., Schulz, K.F., Parulekar, W.R., Krleza-Jeric, K., Laupacis, A., & Moher, D. 2013. SPIRIT 2013 explanation and elaboration: guidance for protocols of clinical trials. *BMJ (Clinical research ed.), 346*, 1-42.
- Cieza, A., Geyh, S., Chatterji, S., Kostanjsek, N., Üstün, B., & Stucki, G. 2005. ICF linking rules: An update based on lessons learned. *Journal of Rehabilitation Medicine, 37*, 212-218.
- Cimera, R.E. 2009. The monetary benefits and costs of hiring supported employees: a pilot study. *Journal of Vocational Rehabilitation, 30*, 111-119.
- Cimera, R.E. & Cowan, R.J. 2009. The costs of services and employment outcomes achieved by adults with autism in the US. *Autism, 13*, 285-302.
- Clifton, D.O. & Harter, J.K. 2003. *Investing in strengths*. Berrett-Koehler, San Francisco.
- Combs, G.M. 2002. Meeting the leadership challenge of a diverse and pluralistic workplace: Implications of self-efficacy for diversity training. *Journal of Leadership & Organizational Studies, 8*, 1-16.
- Council of Australian Governments, 2010. National Disability Strategy 2010-2020; Publishing.
- Craig, P., Dieppe, P., Macintyre, S., Mitchie, S., Nazareth, I., & Petticrew, M. 2008. Developing and evaluating complex interventions: The new Medical Research Council guidance. *BMJ, 337*, 979-983.
- Daniali, S.S., Shahnaz, H., Kazemi, S., & Marzbani, E. 2016. The Effect of Educational Intervention on Knowledge and Self-efficacy for Pain Control in Patients with Multiple Sclerosis. *Materia Socio-Medica, 28*, 283-287.
- de Schipper, E., Mahdi, S., de Vries, P., Granlund, M., Holtmann, M., Karande, S., Almodayfer, O., Shulman, C., Tonge, B., Wong, V.V.C.N., Zwaigenbaum, L., & Bolte, S. 2016. Functioning and disability in autism spectrum disorder: A worldwide survey of experts. *Autism Research, 9*, 959-969.
- Eaves, L.C. & Ho, H.H. 2008. Young adult outcome of autism spectrum disorders. *Journal of Autism and Developmental Disorders, 38*, 739-747.
- Erickson, W.A., von Schrader, S., Bruyère, S.M., & VanLooy, S.A. 2014. The Employment Environment: Employer Perspectives, Policies, and Practices Regarding the Employment of Persons With Disabilities. *Rehabilitation Counseling Bulletin, 57*, 195-208.
- Fitzgerald, S. & Schutte, N.S. 2010. Increasing transformational leadership through enhancing self-efficacy. *The Journal of Management Development, 29*, 495-505.
- Foley, K.R., Dyke, P., Girdler, S., Bourke, J., & Leonard, H. 2012. Young adults with intellectual disability transitioning from school to post-school: A literature review framed within the ICF. *Disability & Rehabilitation, 34*, 1747-1764.
- Garcia-Villamisar, D. & Hughes, C. 2007. Supported employment improves cognitive performance in adults with autism. *Journal of Intellectual Disability Research, 51*, 142-150.
- Gilbride, D., Stensrud, R., Ehlers, C., Evans, E., & Peterson, C. 2000. Employers' attitudes toward hiring persons with disabilities and vocational rehabilitation services. *Journal of Rehabilitation, 66*, 17-23.

- Gilbride, D., Stensrud, R., Vandergoot, D., & Golden, K. 2003. Identification of the characteristics of work environments and employers open to hiring and accommodating people with disabilities. *Rehabilitation Counseling Bulletin, 46*, 130-190.
- Glaser, B.G. & Strauss, A.L. 1973. *The discovery of grounded theory: Strategies for qualitative theory*, Chicago: Aldine.
- Greenwood, R. & Johnson, V.A. 1987. Employer perspectives on workers with disabilities. *Journal of Rehabilitation, 53*, 37-45.
- Hagner, D. & Cooney, B. 2005. "I do that for everybody!": Supervising employees with autism. *Focus on Autism and Other Developmental Disabilities, 20*, 91-97.
- Hardeman, W., Sutton, S., Griffin, S., Johnston, M., White, A., Wareham, N.J., & Kinmonth, A.L. 2005. A causal modelling approach to the development of theory-based behaviour change programmes for trial evaluation. *Health Education Research, 20*, 676-687.
- Hartnett, H.P., Stuart, H., Thurman, H., Loy, B., & Batiste, L.C. 2011. Employers' perceptions of the benefits of workplace accommodations: reasons to hire, retain and promote people with disabilities. *Journal of Vocational Rehabilitation, 34*, 17-23.
- Hedley, D., Uljarevic, M., Cameron, L., Halder, S., Richdale, A., & Dissanayake, C. 2016. Employment programmes and interventions targeting adults with autism spectrum disorder: A systematic review. *Autism, 1*-13.
- Hendricks, D. 2010. Employment and adults with autism spectrum disorders: Challenges and strategies for success. *Journal of Vocational Rehabilitation, 32*, 125-134.
- Hernandez, B. & McDonald, K. 2010. Exploring the Costs and Benefits of Workers with Disabilities. *Journal of Rehabilitation, 76*, 15-23.
- Higgins, K.K., Koch, L.C., Boughfman, E.M., & Vierstra, C. 2008. School-to-work transition and Asperger Syndrome. *Work, 31*, 291-298.
- Hillier, A., Campbell, H., Mastriani, K., Izzo, M.V., Kool-Tucker, A.K., Cherry, L., & Beversdorf, D. 2007. Two-Year Evaluation of a Vocational Support Program for Adults on the Autism Spectrum. *Career Development for Exceptional Individuals, 30*, 125-134.
- Holwerda, A., van der Klink, J.J., Groothoff, J.W., & Brouwer, S. 2012. Predictors for work participation in individuals with an Autism spectrum disorder: a systematic review. *J Occup Rehabil, 22*, 333-352.
- Howlin, P., Alcock, J., & Burkin, C. 2005. An 8 year follow-up of a specialist supported employment service for high-ability adults with autism or Asperger syndrome. *Autism, 9*, 533-549.
- Howlin, P., Goode, S., Hutton, J., & Rutter, M. 2004. Adult outcome for children with autism. *Journal of Child Psychology and Psychiatry, 45*, 212-229.
- IMB Corporation, 2016. IBM SPSS statistics for Windows, Publishing, Armonk, New York.
- Isaac, C., Kaatz, A., Lee, B., & Carnes, M. 2012. An Educational Intervention Designed to Increase Women's Leadership Self-Efficacy. *CBE - Life Sciences Education, 11*, 307-322.
- Kang, M., Ragan, B. G., & Park, J. 2008. Issues in outcomes research: An overview of randomization techniques for clinical trials. *Journal of Athletic Training, 43*, 215-221.
- Kastner, M. & Straus, S.E. 2012. Application of the Knowledge-to-Action and Medical Research Council frameworks in the development of an osteoporosis clinical decision support tool. *Journal of Clinical Epidemiology, 65*, 1163-1170.
- Keel, J.H., Mesibov, G.B., & Woods, A.V. 1997. TEACCH-Supported Employment Program. *Journal of Autism and Developmental Disorders, 27*, 3-9.

- King, S., Rosenbaum, P.L., & King, G. 1995. *The Measure of Processes of Care (MPOC): a means to assess family-centred behaviours of health care providers*. Neurodevelopmental Clinical Research Unit, Hamilton: McMaster University.
- Kirby, A.V., Baranek, G.T., & Fox, L. 2016. Longitudinal predictors of outcomes for adults with autism spectrum disorder: Systematic review. *OTJR Occupation, Participation and Health, 36*, 55-64.
- Kirsh, B. 2000. Organizational culture, climate and person-environment fit: relationships with employment outcomes for mental health consumers. *Work, 14*, 109-122.
- Kregel, J. & Tomiyasu, Y., 1992. General Scale: [Form B.] Joint project of the Rehabilitation Research and Training Center on Supported Employment at Virginia Commonwealth University, Publishing, Richmond, Virginia.
- Krieger, B., Kinebanian, A., Prodinge, B., & Heigl, F. 2012. Becoming a member of the work force: perceptions of adults with Asperger Syndrome. *Work, 43*, 141-157.
- Lawer, L., Brusilovskiy, E., Salzer, M.S., & Mandell, D.S. 2009. Use of vocational rehabilitative services among adults with autism. *J Autism Dev Disord, 39*, 487-494.
- Lorenz, T., Frischling, C., Cuadros, R., & Heinitz, K. 2016. Autism and Overcoming Job Barriers: Comparing Job-Related Barriers and Possible Solutions in and outside of Autism-Specific Employment. *PLoS ONE, 11*, e0147040.
- Maddux, J.E., 1995. Self-efficacy theory: An introduction, in: Maddux, J.E. (Ed.), *Self-efficacy, adaptation, and adjustment: Theory, research, and application*, Publishing, New York, pp. 3-33.
- Martins, A.C. 2015. Using the International Classification of Functioning, Disability and Health (ICF) to address facilitators and barriers to participation at work. *Work, 50*, 585-593.
- Mawhood, L. & Howlin, P. 1999. The Outcome of a Supported Employment Scheme for High-Functioning Adults with Autism or Asperger Syndrome. *Autism, 3*, 229-254.
- McBride, N. 2016. *Intervention research: A practical guide for developing evidence-based school prevention programmes*. Springer, Singapore.
- McConachie, H., Parr, J.R., Glod, M., Hanratty, J., Livingstone, N., Oono, I.P., & Williams, K. 2015. Systematic review of tools to measure outcomes for young children with autism spectrum disorder. *Health Technology Assessment, 19*, 1-538.
- Medical Research Council, 2000. *A framework for development and evaluation of RCTs for complex interventions to improve health*, Publishing, pp. 1-19.
- Medical Research Council, 2008. *Developing and evaluating complex interventions: new guidance*, Publishing, pp. 1-39.
- Medical Research Council, 2015. *Process evaluation for complex interventions: UK Medical Research Council (MRC) guidance*, Publishing.
- Melville, C.A., Cooper, S., Morrison, J., Finlayson, J., Allan, L., Robinson, N., Burns, E., & Martin, G. 2006. The outcomes of an intervention study to reduce the barriers experienced by people with intellectual disabilities accessing primary health care services. *Journal of Intellectual Disability Research, 50*, 11-17.
- Migliore, A., Butterworth, J., & Zalewska, A. 2014. Trends in Vocational Rehabilitation Services and Outcomes of Youth With Autism: 2006–2010. *Rehabilitation Counseling Bulletin, 57*, 80-89.
- Migliore, A., Timmons, J., Butterworth, J., & Lugas, J. 2012. Predictors of Employment and Postsecondary Education of Youth With Autism. *Rehabilitation Counseling Bulletin, 55*, 176-184.
- Morgan, R.L. & Alexander, M. 2005. The employer's perception: employment of individuals with developmental disabilities. *Journal of Vocational Rehabilitation, 23*, 39-49.

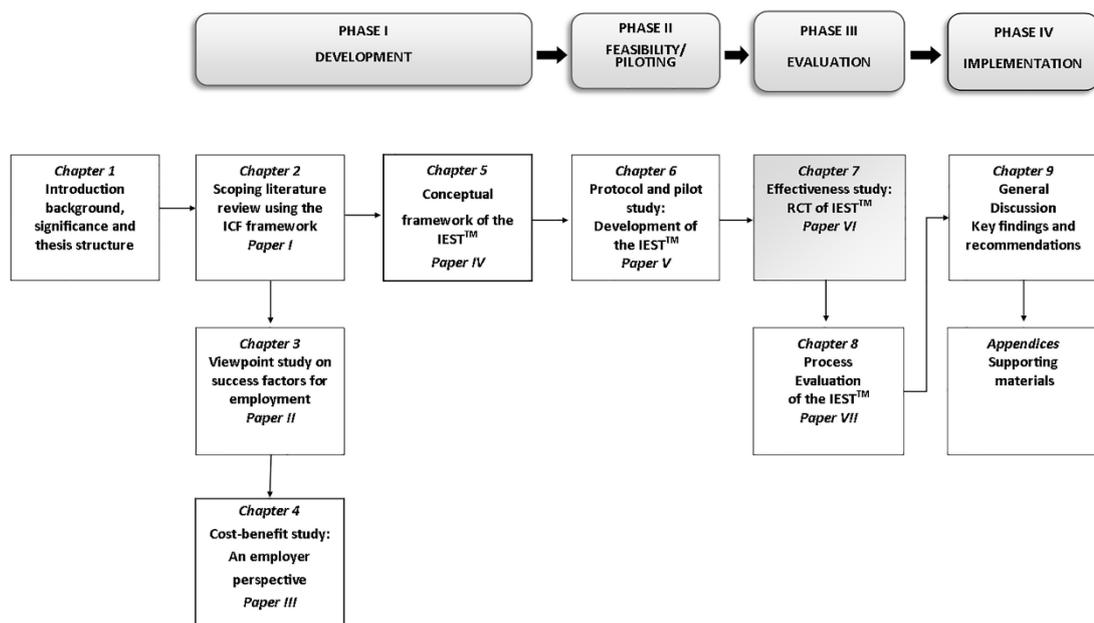
- Müller, E., Schuler, A., Burton, B.A., & Yates, G.B. 2003. Meeting the vocational support needs of individuals with Asperger syndrome and other autism spectrum disabilities. *Journal of Vocational Rehabilitation, 18*, 163-175.
- National Health and Medical Research Council, 2007. Australian code for responsible conduct of research, Publishing, Canberra.
- Nicholas, D., Attridge, M., Zwaigenbaum, L., & Clarke, M. 2014. Vocational support approaches in autism spectrum disorder: A synthesis review of the literature. *Autism*.
- NVivo, 2015. NVivo qualitative data analysis software, Publishing.
- Oakley, A., Strange, V., Bonell, C., Allen, E., & Stephenson, J. 2006. Process evaluation in randomised controlled trials of complex interventions. *British Medical Journal, 332*, 413-416.
- Portney, L.G. & Watkins, M.P. 2009. *Foundations of Clinical Research: Applications to Practice* 3rd ed. Pearson: Prentice Hall, Upper Saddle River: New Jersey.
- Qualtrics, 2005. Qualtrics Publishing, Provo, Utah, USA.
- Rashid, M., Hodgetts, S., & Nicholas, D. 2017. Building Employers' Capacity to Support Vocational Opportunities for Adults with Developmental Disabilities. *Review Journal of Autism and Developmental Disorders, 4*, 165-173.
- Richards, J. 2012. Examining the exclusion of employees with Asperger syndrome from the workplace. *Personnel Review, 41*, 630-646.
- Roux, A.M., Shattuck, P., Rast, J.E., Rava, J.A., & Anderson, K., 2015. National Autism Indicators Report: Transition into Young Adulthood, Publishing, Philadelphia, PA.
- Schneidert, M., Hurst, R., Miller, J., & Ustun, B. 2003. The role of Environment in the International Classification of Functioning, Disability and Health (ICF). *Disability and Rehabilitation, 25*, 588-595.
- Schreuer, N. 2009. Accommodation outcomes and the ICF framework. *Assistive Technology, 21*, 94-104.
- Schulz, K.F., Altman, D.G., & Moher, D. 2010. CONSORT 2010 Statement: updated guidelines for reporting parallel group randomized trials. *Open Medicine, 4*, e60-e68.
- Scott, M., Falkmer, M., Girdler, S., & Falkmer, T. 2015. Viewpoints on Factors for Successful Employment for Adults with Autism Spectrum Disorder. *PLoS One, 10*, e0139281.
- Scott, M., Jacob, A., Hendrie, D., Parsons, R., Girdler, S., Falkmer, T., & Falkmer, M. 2017. Employers' perception of the costs and the benefits of hiring individuals with autism spectrum disorder in open employment in Australia. *Plos One, 12*, 1-16.
- Scott, M., Milbourn, B., Falkmer, M., Black, M., Bölte, S., Halladay, A., M., L., Lounds Taylor, J., & Girdler, S., 2018. Factors impacting employment for people with Autism Spectrum Disorders: A scoping review (in press), Publishing, Autism.
- Seaman, R.L. & Cannella-Malone, H.I. 2016. Vocational skills interventions for adults with autism spectrum disorder: A review of the literature. *Journal of Developmental and Physical Disabilities, 28*, 479-494.
- Sepideh, G., Tayebbeh, R., Mehran, B., & Hamidreza Behnam, V. 2016. Effect of a Supportive Educational Program on Self-Efficacy of Mothers with Epileptic Children. *Journal of Evidence-Based Care, 6*, 49-56.
- Shattuck, P.T., Narendorf, S.C., Cooper, B., Sterzing, P.R., Wagner, M., & Taylor, J.L. 2012. Postsecondary education and employment among youth with an autism spectrum disorder. *Pediatrics, 129*, 1042-1049.
- Smith, M.J., Ginger, E.J., Wright, K., Wright, M.A., Taylor, J.L., Humm, L.B., Olsen, D.E., Bell, M.D., & Fleming, M.F. 2014. Virtual Reality Job Interview Training in Adults with Autism Spectrum Disorder. *Journal of Autism and Developmental Disorders, 44*, 2450-2463.

- Strickland, D.C., Coles, C.D., & Southern, L.B. 2013. JobTIPS: A transition to employment program for individuals with autism spectrum disorders. *J Autism Dev Disord*, 43, 2472-2483.
- Taylor, J.L., McPheeters, M.L., Sathe, N.A., Dove, D., Veenstra-Vanderweele, J., & Warren, Z. 2012. A systematic review of vocational interventions for young adults with autism spectrum disorders. *Pediatrics*, 130, 531-538.
- Unger, D. 2002. Employers' Attitudes Toward Persons with Disabilities in the Workforce: Myths or Realities? *Focus on Autism and Other Developmental Disabilities*, 17, 2-10.
- Unger, D. 2007. Addressing employer personnel needs and improving employment training, job placement and retention for individuals with disabilities through public-private partnerships. *Journal of Vocational Rehabilitation*, 26, 39-48.
- Unger, D. & Kregel, J. 2003. Employers' knowledge and utilization of accommodations. *Work*, 21, 5-15.
- Wehman, P. 2003. Workplace inclusion: persons with disabilities and coworkers working together. *Journal of Vocational Rehabilitation*, 18, 131-141.
- World Health Organization. 2001. *International Classification of Functioning, Disability and Health*. WHO, Geneva.
- World Health Organization. 2007. *International Classification of Functioning, Disability and Health: Child and Youth version*. WHO, Geneva.

Chapter 7: Paper VI-Effectiveness study: RCT of the IEST™

Preface

Chapter 7 reports on the primary outcomes from the randomised controlled trial evaluating the effectiveness of the IEST™ aimed at improving employers' skills in modifying the work environment for their employees on the autism spectrum. Primary outcomes examined included employer self-efficacy, knowledge and attitudes towards autism in the workplace. This chapter is crucial in examining the relevancy of the IEST™ intervention in real life work environments in the Australian context.



This manuscript was accepted for publication on 8 May 2018. Due to copyright restrictions only, the post-print version has been included in the thesis as a typescript. Please note, copyright remains with the journal.

Scott, M, Falkmer, M., Falkmer, T., Girdler, S. Evaluating the effectiveness of an autism-specific workplace tool for employers: A randomised controlled trial. Journal for Autism and Developmental Disorders 2018, 1-16: 10.1007/s10803-018-3611-0.

Evaluating the effectiveness of an autism-specific workplace tool for employers: A randomised controlled trial

Melissa Scott^{1,2}, Marita Falkmer^{1,2,3}, Torbjörn Falkmer^{1,2,4}, and Sonya Girdler^{1,2}

¹School of Occupational Therapy and Social Work, Curtin University, Perth, Australia.

² Cooperative Research Centre for Living with Autism (Autism CRC), Long Pocket, Brisbane, Australia

³School of Education and Communication, CHILD programme, Institute of Disability Research, Jönköping University, Jönköping County, Sweden

⁴Rehabilitation Medicine, Department of Medicine and Health Science (IMH), Linköping University, Linköping, Sweden

Corresponding author:

Melissa Scott, School of Occupational Therapy and Social Work, Curtin University, GPO Box U1987, Perth, Australia.

Email: m.scott@postgrad.curtin.edu.au

Conflict of interest: The authors declare that they have no conflict of interest.

Abstract

A randomised controlled trial evaluated the effectiveness of the Integrated Employment Success Tool (IEST™) in improving employers' self-efficacy in modifying the workplace for individuals on the autism spectrum. Employers (N=84) were randomised to the IEST™ or support as usual groups. Measurements of self-efficacy, knowledge and attitudes towards disability in the workplace were obtained at baseline and post-test. Results revealed a significant improvement in self-efficacy within the IEST™ group between baseline and post-test ($p=0.016$). At post-test, there were no significant differences between groups in relation to self-efficacy in implementing autism-specific workplace modifications and employer attitudes towards disability in the workplace. Given the lack of significant outcomes, further research is needed to determine the effectiveness of the IEST™ for employers.

Trial registration: Australian New Zealand Clinical Trials Registry:

#ACTRN12614000771651, registered 21/7/2014. Trial URL:

<https://www.anzctr.org.au/Trial/Registration/TrialReview.aspx?id=366699>

Keywords

Autism spectrum disorder, complex intervention, hiring, vocational support, work environment

Introduction

Employment is a highly desirable social achievement for most individuals, including those on the autism spectrum (Hendricks 2010). Work facilitates economic independence, engendering a sense of purpose and accomplishment, providing opportunities for socialisation and a mechanism through which to contribute to society (Roux et al. 2013; Krieger et al. 2012; Chen et al. 2015). The importance of work in facilitating well-being for people with disabilities is recognised by the United Nations, who have enshrined the rights of people with disabilities to employment in the Convention on the Rights of Persons with Disabilities (CRPD). The CRPD mandates the right of people with disabilities to employment on a free and equal basis to others, to work in just and equally favourable conditions and to be protected against unemployment (United Nations 2006). In Australia, the Disability Discrimination Act 1992 (Australian Human Rights Commission 1992) advocates for the inclusion of individuals with disabilities in the workplace, requiring employers to remove administrative, environmental and procedural barriers to employment. Despite these legislative requirements, according to the Organisation for Economic Co-operation and Development (OECD), Australia has one of the lowest rates of employment of people with disabilities, with adults on the autism spectrum underrepresented in employment, even in comparison to other disability groups (Organisation for Economic Co-operation and Development (OECD) 2010; Australian Bureau of Statistics 2010). In Australia the unemployment rate for individuals on the autism spectrum of working age (15-64 years) is 32%, in comparison to 10% of all individuals with disabilities, and 6% for individuals without disabilities (Australian Bureau of Statistics 2015). While legislation is vital in mandating against discrimination and exclusion, it does not guarantee enactment

by organisations and employers. Maximising the inclusive practices of workplaces in supporting individuals on the autism spectrum requires a comprehensive understanding of the needs and challenges experienced by employers (Gilbride et al. 2003).

Employers are considered an environmental factor in the employment process, and play a central role in hindering or facilitating work participation for individuals on the autism spectrum (Unger 2002). Employer attitudes towards disability inclusion in the workplace are likely to underpin their hiring decisions. Attitudes are multidimensional and conceptualised as behavioural, cognitive and affective components that have been shaped by a variety of influences (Augoustinos and Walker 1995; Berry and Meyer 1995). Negative employer attitudes towards employees on the autism spectrum result from the perceived concerns relating to their work-related skills, reduced profits from poorer productivity, and incurring additional costs associated with workplace accommodations, supervision and training (Hartnett et al. 2011; Cimera and Cowan 2009; Hernandez and McDonald 2010). Many of these negative attitudes are underpinned by misperceptions and a lack of knowledge regarding autism (Unger and Kregel 2003; Livermore and Goodman 2009). In contrast, positive employer attitudes are influenced by previous experience with employees with a disability (Gilbride et al. 2000; Morgan and Alexander 2005) and an awareness of the potential benefits of retaining qualified, dedicated and meticulous employees on the autism spectrum (Ju et al. 2013; Scott et al. 2017). Employer attitudes are also influenced by organisational factors such as, the size of an organisation and type of industry. Larger organisations and public and social service industries are more likely to hire individuals with disabilities compared to smaller organisations or other industries due to increased resources, less concern in

relation to potential costs, and greater awareness and compliance with corporate social responsibility (Australian Centre for Corporate Social Responsibility 2014; Morgan and Alexander 2005; Houtenville and Kalargyrou 2015). The presence of external supports from disability employment support providers is also associated with positive employer attitudes (Hernandez et al. 2000). Disability employment service providers assist employers with recruitment, job placement, workplace modifications, education and training and ongoing support for employees on the autism spectrum (Smith et al. 2004; Gilbride et al. 2000). Clearly, there is a need to further understand the role of attitudes towards disability in influencing the employment of people with disabilities, including autism.

Employers' capacity, such as their knowledge and confidence in their ability to manage and support employees on the autism spectrum is another factor likely to influence employment outcomes (Rashid et al. 2017). While employer confidence is considered a critical factor in identifying and implementing appropriate and effective workplace modifications (Unger and Kregel 2003), it is often hindered by a limited knowledge of autism (Gates et al. 1996). Consequently, many employers feel uncertain and unprepared in identifying potential workplace difficulties and approaching their employees on the autism spectrum in relation to their specific support needs (Hagner and Cooney 2003). Given the critical role that employers play in job attainment and retention for individuals on the autism spectrum (Mawhood and Howlin 1999), strategies to enhance employer capacity, particularly their confidence, are essential. One such approach may include targeting employers' self-efficacy through education. Self-efficacy refers to an individual's confidence and belief in their ability to perform a task or manage a situation (Bandura 1997). According to Bandura, self-efficacy is a principle determinant of human behaviour

(Bandura 1982, 1997), influencing self-knowledge and beliefs of self-determination (Bandura 1977, 2014), with the achievement of success and avoidance of failure contributing to perceptions of control (Bandura 1995). Perceived self-efficacy is considered to be a powerful motivator, mediating the relationship between knowledge and action (Bandura 1997). Interventions that successfully have targeted self-efficacy, have been proven effective in promoting behaviour change (Sheeran et al. 2016).

Higher levels of perceived self-efficacy are associated with higher performance attainments (Bandura 2014). It is argued that employers with higher self-efficacy are more likely to engage in management practices that promote success (Blackman and Chiveralls 2011). Such practices require an understanding of the potentially mutually beneficial relationship between employers and employees on the autism spectrum (Jacob et al. 2015). In developing this relationship, effective employer management practices include a willingness to provide workplace accommodations, flexibility in modifying work tasks, providing regular supervision and fostering an organisational climate and culture of inclusivity and diversity (Erickson et al. 2014; Hendricks 2010; Scott et al. 2015). Such management practices are contingent on employers understanding the unique needs of their employee/s on the autism spectrum, those supports and interventions most appropriate in meeting their specific needs and when these should be applied and withdrawn (Hagner and Cooney 2005). Effective employers have confidence in recognising potentially challenging situations that may interfere with job performance such as, a planned fire drill or office party celebrations, intervening prior to the events and accommodating their employee's needs accordingly (Gates 1993).

If employers are to fulfill their responsibilities of creating inclusive work environments by enhancing employment opportunities and effectively providing support for individuals on the autism spectrum, then employer education is critical in developing the pre-requisite attitudes and self-efficacy beliefs (Kaye et al. 2011; Unger and Kregel 2003; Sheeran et al. 2016). Employers are currently an under supported and overlooked resource in the work environment (Erickson et al. 2014), with a paucity of studies exploring employers' capacity to support individuals on the autism spectrum (Unger 2007; Hagner and Cooney 2003; Rashid et al. 2017; Wehman et al. 2016). In response to the need to address limitations in current approaches to disability employment support for autism and enhance employers' skills in hiring and supporting individuals on the autism spectrum, the Integrated Employment Success Tool (IEST™) was developed. The IEST™ is a practical, autism -specific workplace manual developed for employers to assist them in hiring, supporting and retaining employees on the autism spectrum. The purpose of the IEST™ is to increase employers' awareness and understanding of autism, including highlighting the strengths of employees on the autism spectrum, to assist employers in identifying potential environmental workplace challenges and to provide strategies, recommendations and modifications required to assist and resolve the environmental workplace challenges encountered by employees on the autism spectrum.

Aims

The primary aim of this study was to evaluate the effectiveness of an autism-specific workplace tool, the IEST™, in improving employers' self-efficacy and knowledge in modifying the work environment to meet the specific needs of their employees on the autism spectrum. The primary research hypothesis was that

employers using the IEST™ would demonstrate increased self-efficacy in modifying the work environment for employees on the autism spectrum. A secondary hypothesis was that employers using the IEST™ would demonstrate more favourable attitudes towards disability in the workplace. Lastly, the study explored whether the post-test scores relating to self-efficacy, knowledge and attitudes towards disability were associated with demographic characteristics, autism experience, size of the organisation and the provision of external disability support in the workplace.

Methods

Design

In accordance with the CONSORT 2010 Statement (Schulz et al. 2010) (Appendix A), a two-armed randomised controlled trial (RCT) was employed to evaluate the effectiveness of the IEST™ intervention, in comparison to usual workplace supports for employers of adults on the autism spectrum.

Participants

Employers were eligible to participate if they were living in Australia; had adequate English to read and comprehend the IEST™ manual; and currently employed at least one adult on the autism spectrum who self-identified as having Asperger's syndrome (AS), high functioning autism (HFA) or autism, reportedly meeting the DSM-IV criteria for autism spectrum disorder (ASD) (American Psychiatric Association 2000). Employees on the autism spectrum were required to be over the age of 18 and working in open or supported paid employment in full-time, part-time or casual positions. While it is acknowledged that AS/HFA are now considered under the broader diagnosis of ASD, as outlined by the DSM-5 (American Psychiatric Association 2013), employees on the autism spectrum in this study were adults diagnosed under the DSM-IV criteria.

Recruitment

Between November 2015 and March 2017, employers were recruited through autism and not-for-profit organisations, disability employment service (DES) providers, online advertisements using social media and community organisation websites, autism community forums and national conferences. In Australia, DES providers are government funded and assist individuals on the autism spectrum with job searches and application, job placement, workplace accommodations and ongoing support. They also provide support to employers in relation to financial subsidies and disability awareness training. Initially, recruitment largely occurred through autism organisations and DES providers contacting employers registered in their databases as employing individuals on the autism spectrum. Eligible employers were invited to participate via their DES provider employment coordinator. The names of those agreeing to participate were provided to the first author, who contacted participants to discuss the study further. However, many DES providers were reluctant to share their employers' details, due to the sensitive nature of their relationship and concern for overloading the requirements of their client, resulting in a poor response rate. In response to the low response rate, secondary recruitment targeted employers via online advertisements, community forums and conferences, requesting employers to contact the first author directly to register their interest. This recruitment process relied on employees disclosing to their employers that they had AS/HFA.

Randomisation

Upon registration, using a simple randomisation technique of a computer-generated coin toss, participants were randomly allocated into the IESTTM intervention group or control group. Participants were blinded to their group allocation and the trial hypotheses but were informed of the broader purpose of the

trial to improve employment outcomes for individuals on the autism spectrum. While this study used individual randomisation to minimize the potential of contamination between groups, if new participants that registered in the trial were from the same organisation or business as a previously registered participant, but worked in a different state, or branch location, they were automatically allocated to the same study group. Randomising at both the individual and organisational level assisted in mitigating the risk of cross-contamination between study groups, ensuring that the control group did not inadvertently receive the intervention, nor were they exposed to it (Portney and Watkins 2009).

Intervention group

Development of the IEST™

The IEST™ is a practical, autism -specific workplace manual that assists employers in hiring, supporting and retaining employees on the autism spectrum. The development of the IEST™ was in response to findings of a multifaceted needs assessment highlighting the importance of the environment in supporting employment outcomes for individuals on the autism spectrum. Overall, the needs assessment pointed to the potential utility of an intervention targeting employers that supported them in modifying the work environment and that could be applied across the employment continuum, from preparing for work to securing and maintaining a job. Subsequently, the needs assessment informed the five objectives of the IEST™ including: 1) creating an awareness of autism; 2) assisting employers to identify potential environmental workplace difficulties; 3) recommending the modifications or strategies to be implemented to resolves workplace difficulties; 4) facilitating a mutually beneficial relationship between employers and employees on the autism spectrum; and, 5) improving employment outcomes in relation to productivity and

job retention. In addition, based on the needs assessment the development of the IEST™ was underpinned by a conceptual framework drawing upon three perspectives including: self-efficacy theory (Bandura 1977), the International Classification of Functioning, Health and Disability (ICF) framework (World Health Organization 2001), and a strengths-based approach (Russo 1999). Self-efficacy is a central tenet in Bandura's social-cognitive theory and was selected as it is considered an important determinant in human behaviour (Bandura 1997, 1982). Interventions targeting a change in self-efficacy have demonstrated a medium-size effect on behaviour change, promoting the development of interventions targeting efficacy beliefs (Sheeran et al. 2016). While social-cognitive theory facilitates an understanding of employers' behaviours based on their autism-related confidence, the ICF framework has a particular utility in understanding the impact of environmental factors on the participation of individuals on the autism spectrum in the workplace, recognising the potential barriers and facilitators within the physical, social or attitudinal environment (Schneidert et al. 2003). Recent ICF Core Sets for ASD have identified a number of relevant environment factors (Bölte et al. 2017). Lastly, a strengths-based approach identifies and fosters the skills and abilities of individuals on the autism spectrum, rather than counteracting their weaknesses (Russo 1999; Lorenz and Heinitz 2014). Fundamentally, the IEST™ intervention aims to encourage employers to recognise the strengths and difficulties of employees on the autism spectrum, and implement effective workplace modifications to support them accordingly.

Content of the IEST™

The IEST™ is a practical manual consisting of eight modules each containing autism-specific information, checklists and goal setting activities, workplace

modification strategies and additional work-related resources (Table 1). The first three modules provide employers with instructions regarding the implementation of the IEST in their workplace and information about autism and navigating the employment process. The latter five modules specifically address each phase of the employment process including: *Phase 1*: Advertising the job; *Phase 2*: The interview; *Phase 3*: Job commencement and placement; *Phase 4*: Workplace modifications; and, *Phase 5*: Ongoing support. Each phase contains three checklists prompting employers to consider: i) the different factors impacting each phase of the employment process; ii) the potential workplace difficulties that may arise; and, iii) a summary checklist ensuring the appropriate modifications have been implemented and accounted for. In addition, three online video tutorials are provided as a means of guiding participants through the manual. The tutorials inform employers about the purpose of the IEST™, how to navigate the manual, and choose their stage in the employment process. The tutorials were designed to be succinct and informative and are no longer than four minutes.

Implementation of the IEST™

The IEST™ intervention was implemented in employers' work environment over a 12-week period. Participants chose to receive a paper-based or interactive PDF version of the intervention manual. A prescribed 'dosage' of the IEST™ for employers was not feasible given the unique and varying needs of employees on the autism spectrum and the organisational differences likely to exist between work environments. Instead, employers were instructed to use those aspects of the IEST™ most relevant to the needs of their employee on the autism spectrum and their work environment. In modifying the work environment to meet the needs of employees on the autism spectrum, employers were instructed to identify which stage in the

employment process they were presently at, then subsequently evaluate the work environment; implement appropriate modification strategies; and re-evaluate the modified work environment. Throughout the 12-week trial period, participants were encouraged to contact the research team with regard to any support needs, questions and/or concerns relating to the use and implementation of the IEST™ intervention. The research team responded to participant support needs via emails, phone calls or onsite visits accordingly.

Table 1. IEST™ manual overview

Modules	Description	Resources included
Introduction	Information explaining the purpose of the IEST™ manual, the potential benefits its use and instructions detailing as to how it should be used in work environments	Video tutorial links, IEST™ navigation key
Information on autism	Information explaining autism across 5 domains: 1) understanding autism; 2) strengths of individuals on the autism spectrum; 3) autism in the workplace; 4) understanding potential workplace difficulties; and, 5) creating an inclusive work environment	Information only module
The employment process	The employment process explained, factors for successful employment, identifying the stages in the employment process and implementing the IEST™ in the workplace	Employment process decision tree Tips for implementing the IEST™
<i>Phase 1:</i> Advertising the job	Guides the recruitment approach including strategies for, the job description, job advertising approach, reasonable adjustments and financial assistance	To-do list prior to recruitment checklist Identifying potential difficulties checklist Completed checklist Links to useful and practical websites
<i>Phase 2:</i> The interview	Guides the interview process including modification strategies according to three stages, prior, during and follow-up after the interview. The module explores interview structure, questions, disclosure and accommodations	To-do list prior to the interview checklist Identifying potential difficulties checklist Completed checklist Links to useful and practical websites Additional resources on disability disclosure
<i>Phase 3:</i> Job commencement and placement	Guides the commencement and placement of a new employee on the autism spectrum in the workplace including strategies for, orientation and training, job expectations, productivity requirements, connecting with a supervisors/mentor, developing a support plan and employer financial assistance	To-do list prior to job commencement and placement checklist Identifying potential difficulties checklist Completed checklist Links to useful and practical websites Additional resources on employer financial assistance and workplace training Support plan template

Table 1. Continued

Modules	Description	Resources included
<i>Phase 4:</i> Workplace modification	Guides the workplace modification process according to the unique and specific needs of the employee on the autism spectrum. Work modification occurs across 5 environments: 1) sensory; 2) social; 3) communication; 4) activity and task; and 5) physical	To-do list prior to workplace modifications checklist Identifying potential difficulties checklist Completed checklist per environment modification area Links to useful and practical websites Workplace modification interactive decision chart Hygiene checklist Goal planner template Priority task planner template
<i>Phase 5:</i> Ongoing support	Guides the process of providing ongoing support, adjusting to the employee's specific needs and regularly re-evaluating the effectiveness of the current workplace modifications	To-do list for ongoing support checklist Identifying potential difficulties checklist Completed checklist Links to useful and practical websites Stress/anxiety management strategies Re-evaluate support plan template Supervisor/mentor handover template

Control group

Control group participants continued with their 'usual care of employment support' externally provided by community DES providers, without receiving any other additional interventions. 'Usual care of employment support' may have included on-the-job training, assistance accessing financial subsidies and the provisions of non-autism specific workplace accommodations. External support from DES providers was delivered approximately every four to six weeks, varying according to the employer's support needs. Control participants who were not associated with a DES provider did not receive any employment support, nor did the current study provide any support, strategies and recommendations or information.

Procedure

Data were collected online via the Qualtrics platform (Qualtrics 2005). Following randomisation, participants were sent an electronic questionnaire via email. These measures were administered at baseline and post-test, 12-weeks later. On completion of baseline measures, participants allocated to the intervention group were sent a copy of the IEST™ in their preferred format (either paper-based or interactive PDF version) to begin using in their workplace. The 12-week timeline began from intervention implementation. The control group's timeline began on completion of baseline measures and continued with their workplace support as usual. At post-test, participants were given 2-3 weeks to complete the repeat questionnaires, receiving phone call and email reminders as required.

Outcome measures

In line with the theoretical underpinning of the IEST™, the primary outcomes of this study were self-efficacy and knowledge, with a secondary outcome exploring employer attitudes towards disability in the workplace.

Demographic characteristics

A structured questionnaire covering demographic characteristics, vocational history, organisational characteristics and experience supporting employees on the autism spectrum was completed by all participants.

Primary outcome measure-Employer Self-Efficacy Scale

Selecting an appropriate outcome measure is critical in evaluating interventions and may influence the value and usefulness of the results (Coster 2013). When no available measure with established reliability and validity exists to address the operationalised constructs of an intervention, the use of a purposefully developed measure is required (McBride 2016; Bartholomew et al. 2011). A

comprehensive review of the literature revealed that there were no appropriate measures available to examine employer self-efficacy in relation to supporting employees on the autism spectrum according to the specific constructs of identification, provision and implementation of workplace modifications. This necessitated the development of the Employer Self-Efficacy Scale (ESES). The ESES consists of 20 items, comprising five dimensions representing the employment process including, recruitment, job interview, job placement and commencement, workplace modifications and ongoing support. Each item is scored using a 10-point Likert scale ranging from ‘*not at all confident*’ to ‘*completely confident*’. A Cronbach alpha coefficient of 0.97 indicated excellent internal consistency of the scale. Construct validity of the scale was established through expert review within the research team and externally through a community reference group comprising of adults on the autism spectrum, parents of individuals on the autism spectrum, teachers in transition planning, employment co-ordinators, clinicians and researchers. Following expert opinion, the ESES was piloted with a small group of participants (N=12) including adults on the autism spectrum ($n=2$), employers ($n=4$), DES provider employment co-ordinators ($n=2$) and expert researchers in autism ($n=4$), providing formative and process feedback on its feasibility and recommendations for change. The tool supports the calculation of an overall score and a score for each of the five dimensions, with a higher total score indicative of higher self-efficacy (Appendix F).

Secondary outcome-The Scale of Attitudes Toward Workers with Disabilities

In measuring employer attitudes towards employees on the autism spectrum, the absence of a ‘gold-standard’ outcome measure necessitated the use of a tool designed to measure attitudes towards disability in general within the broader

population (McConachie et al. 2015). The Scale of Attitudes Toward Workers with Disabilities (SATWD) is a standardised tool used to quantify and measure employer attitudes towards employees with a disability in the workplace, consisting of 25 items rated on a 7-point (-3 to +3) Likert-type scale (Kregel and Tomiyasu 1992, 1994). Participants are required to rate their level of agreement with each item based on their feelings towards and experiences with employees with disabilities. The scale was designed to minimize the influence of individual responses, with items placed at relatively equal intervals. Ratings for each item are computed to provide a total universal score. The absolute value of each rating was used as the measure of intensity for each item, as several of the items were negatively worded, indicating that an item could have a negative mean rating, yet suggest a positive attitude towards disability in the workplace (Kregel and Tomiyasu 1994). Higher total scores indicate a more positive attitude towards disability in the workplace. Weighted Cohen's Kappa scores ranging between 0.70 to 0.87 demonstrated high inter-rater reliability for the SATWD (Kregel and Tomiyasu 1992).

IESTTM feedback

A brief, structured questionnaire regarding fidelity and dose were obtained at post-test from participants in the IESTTM group only.

Sample size

A power calculation estimated that in order to identify a moderate to large effect size ($d= 0.5 - 0.8$), with 80% power and $\alpha=0.05$, a total sample size of 80 ($n=40$ in each group) would be required. Given the fact that the IESTTM has not been tested as an intervention, this sample size also allowed for the expected 20% attrition rate that may occur throughout the study trial.

Statistical analysis

Data were managed and analysed using SPSS version 24 software (IBM Corporation 2016). Intention-to-treat analysis was conducted using the last observation carried forward (LOCF) method to account for missing data, and per-protocol analysis accounted for the comparison of groups for participants who completed the trial. Continuous data were checked for normality using the Kolmogorov-Smirnov test. Descriptive statistics such as, frequency and chi-square analyses were used to describe the demographic profile of employers. Paired and independent sample t-tests, in addition to Wilcoxon Signed-Rank and Mann-Whitney *U* tests were used to compare within and between-group differences in self-efficacy and employer attitudes towards supporting employees on the autism spectrum at baseline and post-test, respectively. In addition, a two-way between group analysis of variance analyses were conducted to examine the main and interaction effects of sex and group allocation on employers' self-efficacy scores at baseline (baseline total ESES for group equivalence) and change due to the intervention (change in total ESES score). Following convention, a *p*-value < 0.05 was taken to indicate a statistically significant association in all tests.

Ethics

Registered participants were sent electronic information sheets outlining the purpose of the study and informed consent was obtained from all individual participants included in the study. Data collected from the study were de-identified and securely stored to maintain confidentiality and privacy of participants. Ethical approval was obtained from the university's Human Research Ethics Committee. The trial was also registered with the Australia and New Zealand Clinical Trial Registry. All procedures performed in studies involving human participants were in

accordance with the ethical standards of the institutional committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Results

Participant characteristics

Of the 121 employers assessed for eligibility, 84 met the inclusion criteria. Participants were randomised to the intervention ($n=43$) or control ($n=41$) group prior to completing baseline measures. During the trial, two participants formally withdrew due to a change in employment, three participants from the intervention group withdrew, citing time constraints as their reason and nine participants were lost to follow-up. All participants were however, included in the intent-to-treat analysis. Flow of participants through the trial is shown in Figure 1.

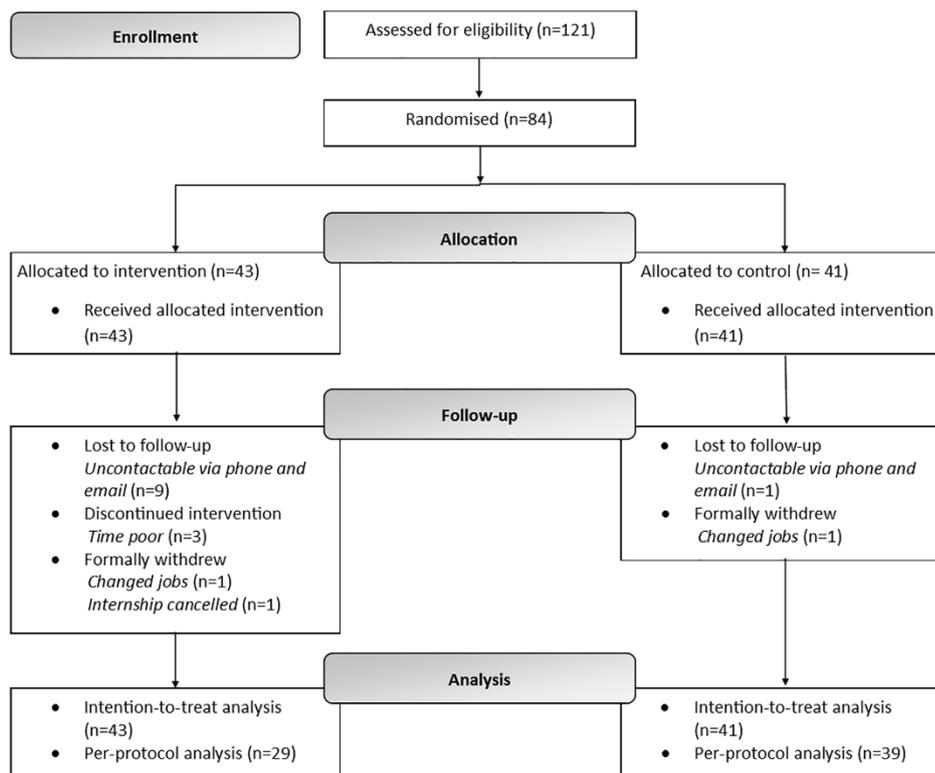


Figure 1. Flow of participants through the trial.

Figure 1. Flow of participants through the trial

Baseline comparison revealed that there were significant differences between the study groups in regards to sex, as shown in Table 2. Despite random allocation, more than two thirds of the intervention group consisted of men responding to the questionnaire, with the reverse being true for the control group. No other group differences in demographic characteristics were found. The industry distribution of participants was broad, with manufacturing (15.5%), health care and social assistance (13.1%) and financial and insurance services (7.1%) being most prevalent, and representative of the size and industry type of Australia generally (Department of Industry Innovation and Science 2016).

Table 2. Baseline demographic characteristics and employment-related variables by group

	Intervention group (n=43)	Control group (n=41)	df	X²	p-value
Biological sex			1	12.17	0.0005*
Male	30 (69.8%)	13 (31.7%)			
Female	13 (30.2%)	28 (68.3%)			
Age			2	3.19	0.2
21-34	7 (16.3%)	5 (12.2%)			
35-44	17 (39.5%)	10 (24.4%)			
45+	19 (44.2%)	26 (63.4%)			
Organisation size ^a			2	2.42	0.3
Small (1-49)	14 (32.6%)	10 (24.4%)			
Medium (50-250)	12 (27.9%)	9 (22.0%)			
Large (>250)	15 (34.9%)	22 (53.7%)			
Job title ¹			2	3.39	0.18
Manager	21 (48.8%)	16 (39.0%)			
Supervisor	12 (27.9%)	8 (19.5%)			
Colleague	9 (20.9%)	16 (39.0%)			
Previous experience with employees with a disability			1	1.68	0.19
Yes	17 (39.5%)	22 (53.7%)			
No	26 (60.5%)	19 (46.3%)			
Experience supporting employees on the autism spectrum ^a			3	3.97	0.27
Less than year	13 (30.2%)	6 (14.6%)			
1-2 years	11 (25.6%)	9 (22.0%)			
3-4 years	5 (11.6%)	9 (22.0%)			
More than 4 years	12 (27.9%)	14 (34.1%)			
Number of employees on the autism spectrum currently being supported ^a			2	1.91	0.39
1	20 (46.5%)	15 (36.6%)			
2-3	7 (16.3%)	7 (17.1%)			
4+	8 (18.6%)	13 (31.7%)			
Hours of support provided per week			1	0.14	0.71
0-9 ^c	34 (79.1%)	31 (75.6%)			
≥10	9 (20.9%)	10 (24.4%)			
Receive Disability Employment Service support ^a			1	2.41	0.12
Yes	18 (41.9%)	24 (58.5%)			
No	24 (55.8%)	16 (39.0%)			

Note. ^a Excludes missing cases; ^b Calculated using Fisher's Exact test; ^c Support provided may approximately be equivalent to 1 full day of work; *p<0.05

Intention-to-treat analysis

For the ESES, there was a significant improvement within the intervention group between baseline and post-test ($p=0.016$), indicating the participants in this group experienced an increase in their confidence in supporting and implementing workplace modifications for employees on the autism spectrum (Table 3). The ESES scores for the control group did increase during the trial period, but this was not significant ($p=0.41$). While there was a noticeable difference in ESES scores at baseline between the intervention group ($M=127.91$) and control group ($M=139.71$), between-group analysis revealed no significant differences in confidence at baseline ($p=0.18$) and post-test ($p=0.42$), respectively. For the SATWD, there were no significant attitudinal improvements for within and between-group scores for participants. Both groups' total SATWD scores (intervention group means: 103.51 vs 104.67; control group means: 104.59 vs 104.41) consistently indicated generally positive attitudes towards employees on the autism spectrum across baseline and post-test.

Table 3. Intention-to-treat analysis for self-efficacy and workplace attitudes

Variables	Intervention group (n=43)					Control group (n=41)					
	Baseline		Post-test		p-value (within)	Baseline		Post-test		p-value (within)	p-value (between)
	Mean	SD	Mean	SD		Mean	SD	Mean	SD		
Total ESES scores	127.91	41.96	137.40	34.39	0.016*	139.71	36.80	143.27	31.43	0.41	0.42
Total SATWD scores	103.51	12.98	104.67	10.97	0.43	104.59	12.34	104.41	12.24	0.91	0.92

Note: ESES: Employer Self-Efficacy Scale; SATWD: The Scale of Attitudes Toward Workers with Disabilities; SD: Standard deviation; *p<0.05

Per-protocol analysis

Per-protocol analysis was conducted for the remaining intervention ($n=29$) and control ($n=39$) group participants, who completed the 12-week trial, including both baseline and post-test measures. In general, the per-protocol analysis produced similar results to those of the intention-to-treat approach. For the ESES, there was a significant improvement in participants' confidence within the intervention group between baseline ($M=127.24$, $SD=43.09$) and post-test ($M=141.31$, $SD=30.70$; $p=0.015$), but no significant improvements within the control group between baseline ($M=142.77$, $SD=33.82$) and post-test ($M=146.51$, $SD=27.10$; $p=0.41$). Similarly, between-group analysis for ESES scores (intervention group means: 127.24 vs 141.31; control group means: 142.77 vs 146.51) indicated no significant differences in confidence both at baseline ($p=0.1$) and post-test ($p=0.46$). Per-protocol analysis of the SATWD required the use of non-parametric statistics. For the SATWD, a Wilcoxon Signed-Rank test indicated no significant attitudinal improvements within groups (intervention group: $Z=-0.83$, $p=0.41$; control group: $Z=-0.40$, $p=0.69$). Similarly, a Mann-Whitney U test indicated no significant attitudinal improvements between group scores at post-test (intervention group $Mdn=108$, control group $Mdn=104$, $U=541$, $p=0.77$). The per-protocol analysis also demonstrated generally positive attitudes to employees on the autism spectrum in the workplace for both groups (intervention group medians: 106 vs 108; control group medians: 106 vs 104) at baseline and post-test, respectively.

Subgroup per-protocol analysis for IESTTM users

IESTTM feedback results from intervention group ($n=29$) at post-test indicated 38% of the intervention group had not used the IESTTM at all during the 12-week trial period. Of the 62% who indicated that they used the intervention, only 24% had

used it on a regular basis in their workplace. To explore whether the intervention dosage affected self-efficacy and attitudinal outcomes, further analyses were conducted comparing two subgroups to the control group. Subgroup 1 ($n=18$) consisted of participants who used the IEST™ at any frequency, including once, monthly, fortnightly and weekly use; and subgroup 2 ($n=7$) consisted of participants who used the IEST™ on a regular weekly to fortnightly basis, only.

Subgroup 1 analysis

Results for the ESES were found to be similar to those of both the intention-to-treat analyses and per-protocol analyses, with no significant differences between-groups at baseline ($p=0.22$) and post-test ($p=0.83$). The only significant improvement occurred within the intervention group's confidence between baseline ($M= 130.44$, $SD=37.54$) and post-test ($M= 148.11$, $SD=21.79$; $p=0.038$), indicating that the intervention group's confidence ($M=148.11$) was higher than that of the control group's ($M=146.51$) at post-test. The improvement in the intervention group's confidence a medium effect size ($d=0.58$), while improvement in control group was a small effect size ($d=0.12$). This finding appeared to be related to participants' use of the IEST™ in their workplace regardless of dosage. For the SATWD, there were no significant attitudinal improvements within groups (intervention group: $Z=-1.72$, $p=0.09$; control group: $Z=-0.40$, $p=0.69$) and between-groups (intervention group: $Mdn=107$; control group: $Mdn=104$, $U=338.50$, $p=0.83$ at post-test).

Subgroup 2 analysis

Results for the ESES and SATWD were found to be similar to that of the subgroup 1 analysis and revealed no significant differences between groups at baseline and post-test, respectively. Interestingly, within-group analysis for the intervention group at baseline and post-test indicated significant improvements in

both participants' confidence in supporting employees on the autism spectrum ($Z=-2.37$, $p=0.0018$), and their attitudes towards disability in the workplace ($Z=-2.38$, $p=0.018$). These findings suggest that when participants used the IEST™ on a regular weekly to fortnightly basis, the tool was effective in improving employers' self-efficacy and knowledge and promoting favourable attitudinal change towards employees on the autism spectrum. Given the small sample size, these results need to be interpreted with caution.

Analysis to determine whether total ESES scores vary by sex and group allocation

Following the analysis of baseline participant demographics and employment-related variables, significant differences between groups were found for sex (Table 1). Two-way ANOVA models were conducted to explore whether total ESES scores varied by sex and group allocation. The effect of group allocation and the interaction between sex and group allocation on total ESES scores at baseline ($p=0.77$) and over time (change in total ESES scores, $p=0.74$) was not significant. These findings suggest that while there were significantly more men in the intervention group in comparison to the control group at baseline, sex did not significantly impact on the change in total ESES scores over time. These findings assisted in understanding the potential impact of selection bias and reduced any threat to internal validity resulting from initial differences between the study groups with regard to biological sex.

Discussion

The purpose of this RCT was to evaluate the effectiveness of the IEST™ in improving employers' self-efficacy, knowledge and attitudes towards modifying the work environment to meet the specific needs of their employees on the autism

spectrum. Overall, when compared to employment supports as usual, the IEST™ did not significantly improve employers' self-efficacy and attitudes towards autism in the workplace. While the implementation of the intervention under real life conditions in natural workplace settings may have enhanced the ecological validity of this study, it is possible that a number of factors have influenced the findings of the present study (Marchand et al. 2011).

The greatest degree of change reported by the intervention group was in employers' self-efficacy with regard to supporting individuals on the autism spectrum in the workplace, as measured by the ESES tool. Given that the intervention was underpinned by Bandura's social-cognitive theory, these findings are consistent with the concept that implementing an intervention that increases knowledge, increases self-efficacy (Bandura 1993). The intervention group's significantly improved self-efficacy scores, over the 12-week trial period reflects their perceived increase in ability to manage obstacles and challenges more efficiently, and remain in control of the situation (Bandura 1986, 1977). Improved self-efficacy is an essential component in developing effective and flexible management practices of employers, particularly regarding the unique and varying difficulties experienced by individuals on the autism spectrum in the work environment (Hagner and Cooney 2005). Employment success is not always dependent on an employee's ability to modify their behaviour, but is likely equally contingent on employers' knowledge of the autism, and confidence and capacity in identifying and providing appropriate and effective workplace supports (Hagner and Cooney 2005; Hillier et al. 2007; Unger and Kregel 2003). In contrast, when exploring between group differences for self-efficacy, the control group's baseline ESES scores were noticeably, but not significantly, higher than the intervention

group's. Interestingly, at post-test, ESES scores for the intervention group were similar to that of the control group's. While it possible that the intervention group simply regressed to the mean rather than indicating true improvement, the change in ESES scores for employers using the IEST™ were characterised by a medium effect size ($d=0.58$) compared to the control group's small effect size ($d=0.12$). This finding suggests that the significant improvement demonstrated within the intervention group was likely attributable to the use of the IEST™ in their workplace, indicating its usefulness in improving employers' self-efficacy.

The findings that the IEST™ did not significantly improve employers' self-efficacy and attitudes compared to the control group may be explained by the issue of compliance in the study. More than two thirds of the intervention group only used the IEST™ once, monthly or not at all, with the remaining participants using it on a regular to fortnightly basis. While the IEST™ did not have a prescribed dosage due to the unique and varying support needs of employees on the autism spectrum and the differences likely to exist between work environments, the issue of compliance may be attributed to several factors. The IEST™ was provided to employers either as a paper-based or interactive PDF version. The format may have been considered impractical and time-consuming given the delivery of the IEST™ in the form of a comprehensive manual, particularly for time-poor employers driven by productivity, deadlines and profit (Domzal et al. 2008). Employers benefit from resources that are informative and practical, but can also be readily accessed and implemented (Unger and Kregel 2003). Many organisations access the internet on a daily basis to complete work tasks. The delivery of the IEST™ as a web-based application, available on a variety of electronic devices may have increased its usability (Wantland et al. 2004). Further, the IEST™ is a comprehensive manual addressing

autism in the workplace, designed to guide employers through a step-wise process of implementing specific workplace strategies. It is possible that for many employers reading the manual thoroughly, once, was sufficient in meeting their needs and concerns, rather than using it on a regular basis. Lastly, the phrasing of the question in relation to employers' use of the IEST™ was, 'How often have you used the IEST™ tool?', with responses categories including 'Not at all', 'Daily', 'Weekly', 'Fortnightly', 'Monthly', and an open response of 'Other-specify', which was open to interpretation. The question did not define the use of the IEST™ to include activities such as, reading the manual, sharing it as resource with co-workers or using it to support staff training on disability awareness. In addition, measuring for the use of the IEST™ was only assessed at post-test in the trial. A more accurate representation of the use of the IEST™ may have been achieved with weekly or fortnightly phone calls requesting this information over the 12-week trial period. Collectively, these issues may have impacted in varying degrees on both the acceptability of the IEST™ and measuring the fidelity of the intervention group.

With the exception of a small group of participants within the intervention group, who used the IEST™ regularly, either weekly or fortnightly, no significant attitudinal improvements were found. Despite these results, participants generally held positive attitudes towards employees on the autism spectrum. Favourable attitudes towards disability in the workplace are associated with previous experiences, larger organisations and external support (Ju et al. 2013). Previous experiences influence employers' likelihood and willingness to hire individuals with disabilities in the future (Gilbride et al. 2000; Morgan and Alexander 2005), a finding supported in the present study, with almost 50% of all participants having previously worked with individuals with a disability, and 42% employing more than

one employee on the autism spectrum. Large organisations (250+ employees), of which more than a third of participants in this study were associated with, are more likely to hire individuals on the autism spectrum compared to medium or small organisations (Houtenville and Kalargyrou 2012). This may be attributed to the fact that large organisations have more resources, less concern with the perceived associated costs of supervision and workplace modifications, and a greater awareness and compliance with corporate social responsibility (Kregel and Tomiyasu 1994; Morgan and Alexander 2005; Australian Centre for Corporate Social Responsibility 2014). Another factor influencing positive attitudes may be external support from DES providers. In the Australian context, DES providers fulfill a necessary role in assisting employers with recruitment, job placement, accommodations and ongoing support (Gilbride et al. 2000), with 50% of participants in the present study receiving such support. It has been recognised that the collaborative approach between employers and DES providers is important in promoting effective and positive employment outcomes for employees with a disability (Greenwood and Johnson 1987; Luecking 2008; Smith et al. 2004). The IEST™ did not improve employer attitudes, but given that attitudes predict behaviour (Glasman and Albarracín 2006), the consistently favourable employer attitudes reported by participants in this study over the 12-week trial period suggests that employees on the autism spectrum were likely to receive the support they needed.

Limitations

Sampling bias

Limitations potentially associated with sampling bias included the relatively small sample size and characteristics of participants. The process of identifying and recruiting employers with no previous autism-related experience and those without

the support of DES providers was particularly difficult, due to the issues of disclosure and confidentiality in the workplace. It is likely an autism-specific workplace tool would have been most beneficial to this group of employers. Given the complex nature of this research, particularly in relation to disability disclosure in the workplace and the current fluctuating Australian job market, recruitment necessitated a reliance on DES providers sharing employer contact details with the research team, many of which were already employing individuals on the autism spectrum and were not likely to demonstrate the most significant change in response to the IEST™. In addition, the small sample size may not have been representative of the broader population of Australian employers hiring and supporting individuals on the autism spectrum. Those recruited may have been employers with the most positive experiences of employees on the autism spectrum or had personal connections with an individual on the autism spectrum, making them more likely to have participated in this study. Participant characteristics may also impact the generalisability of the results, with 50% of participants in this study supported by DES providers and due to the nature of their supportive relationship and the financial assistance provided, may have felt obliged to participate in the trial.

Methodological issues

Randomisation was conducted prior to participants completing baseline measures in an attempt to prevent cross-contamination between groups. While randomisation reduces systematic bias in regard to study groups, significant differences were found between groups in relation to biological sex at baseline. This may have been the inadvertent result of randomisation occurring at the level of the workplace and not at the individual (employer) level. However, this was addressed through: i) the administration of baseline measures online, whereby participants completed measures independently, with no involvement from the research team;

and, ii) an analysis of the effect of sex demonstrated that it did not influence total self-efficacy scores between groups.

The lack of autism-specific outcome measures in employment necessitated the development of the ESES. This is not a standardised measure, and while internal consistency and construct validity were established, the results should be interpreted with caution as further validity, reliability and sensitivity and specificity of the self-efficacy constructs are yet to be established. Although subgroup analyses assisted in supporting the usefulness of the IEST™ for some employers, a lack of clarity remains as to whether the IEST™ intervention itself was effective, rather than an increase in frequency of its utilisation in the workplace. This is a limitation because ‘dosage’ of the IEST™ intervention for subgroups of IEST™ users is compared to all of the control group participants’ dosage as per their ‘usual care of employment support’. To better understand the usefulness of the IEST™ it would have been more beneficial to compare subgroups of IEST™ users to subgroups of control participants based on each groups’ ‘dosing’ respectively. In addition, given that the IEST™ is considered an educational intervention providing information to employers about autism in the workplace, it would have been optimal to gather data from the control group about any information provided to them by DES providers, co-workers or HR departments during the trial period. Autism-specific information provided to the control group may have influenced their outcomes, so this study may have overestimated the true impact of the IEST™ over ‘usual care of employment support’ which may include standard practices in providing information to employers.

Lastly, it is acknowledged that both demographic information in relation to age, sex presence of intellectual disability, severity and education level; and

employment outcomes including job satisfaction, work performance and retention for individuals on the autism spectrum would have strengthened the methodological framework. This study did not collect this information as it focused environmental factors in employment, focusing on employers and their capacity to implement a workplace intervention, rather than concentrating on characteristics and outcomes of individuals on the autism spectrum themselves. However, this study did necessitate a reliance on employees declaring to their employer that they were on the autism spectrum (AS/HFA).

Clinical implications and future directions

The present study has important implications for both employers and DES providers. A needs assessment pointed towards a need for an autism-specific workplace tool for employers, with this current study indicating the IEST™ as beneficial to employers, particularly those with no previous autism-related experience and those without the support of a DES provider. While many employers in the present study had previous experience with employees with a disability, future studies further exploring the effectiveness of the IEST™ would benefit from an employer population with little to no previous experience in this area. The IEST™ may also be a useful tool for DES providers in supporting new and existing employers between workplace visits. In Australia, very few autism-specific DES providers exist to support the unique needs of individuals on the autism spectrum in the workplace. Given the importance of the relationship between DES providers and employers, until such services are developed, the IEST™ may be a helpful resource. Given one of the aims of the IEST™ is to provide employers with recommendations and strategies to modify the work environment for their employees on the autism spectrum, it would be helpful to know what specific modifications were implemented

by employers. Such information may be useful in refining and improving the IEST™ for future employers according to modifications found to be most effective, time-efficient and/or cost-effective.

Conclusion

To the authors' knowledge, this study is the first to explore the effectiveness of an employer-based intervention, under real workplace conditions, with the potential to improve employment outcomes for the autism population. While the current study found no significant differences between groups for employer self-efficacy preliminary evidence suggested that the IEST™ was beneficial in improving employers' confidence and knowledge in modifying the work environment. The results of the present study highlighted the need to further evaluate the effectiveness of the IEST™ in larger groups of employers with little to no previous experience. It would be beneficial to also consider alternative formats and delivery of the IEST™ to the employer population. The current study revealed some of the difficulties associated with conducting an intervention study under real world conditions with employers. The difficulties encountered in this current study reinforced the continued need for new research approaches allowing a better understanding of employers' needs and the key role they play in the employment process (Ellenkamp et al. 2016).

References

- American Psychiatric Association (2000). *Diagnostic and statistical manual of mental disorders (4th ed, text rev.)*. Washington, DC: Author.
- American Psychiatric Association (2013). *Diagnostic and statistical manual of mental disorders (5th ed, text rev.)*. Arlington, VA: American Psychiatric Publishing.
- Augoustinos, M., & Walker, I. (1995). *Social cognition: An integrated introduction*. London: UK: SAGE Publications Ltd.
- Australian Bureau of Statistics (2010). Survey of disability, ageing and carers; cat. no. 4430.0. Canberra, ACT: Australian Government.
- Australian Bureau of Statistics (2015). Disability, ageing and carers, Australia: Summary of Findings. Canberra: ABS.
- Australian Centre for Corporate Social Responsibility (2014). The 10th year-Progress and prospects for CSR in Australia and New Zealand: The state of CSR in Australia and New Zealand annual review 2014. (pp. 1-20). Docklands, Victoria: Australian Centre for Corporate Social Responsibility.
- Australian Human Rights Commission (1992). Disability Discrimination Act. (Vol. 135, pp. 1-75). Australia.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. [Article]. *Psychological Review*, 84(2), 191-215, doi:10.1037/0033-295X.84.2.191.
- Bandura, A. (1982). Self-efficacy mechanism in human agency. [Article]. *American Psychologist*, 37(2), 122-147, doi:10.1037/0003-066X.37.2.122.
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Engelwood Cliffs, NJ: Prentice-Hall.
- Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. [Article]. *Educational Psychologist*, 28(2), 117-148, doi:10.1207/s15326985ep2802_3.
- Bandura, A. (1995). *Self-efficacy in changing societies*. New York: Cambridge University Press.
- Bandura, A. (1997). *Self-efficacy : the exercise of control / Albert Bandura*. New York: W.H. Freeman & Co.
- Bandura, A. (2014). Exercise of personal agency through the self-efficacy mechanism. In R. Schwarzer (Ed.), *Self-efficacy: Thought control of action* (pp. 3-38). New York: Routledge.
- Bartholomew, L. K., Parcel, G. S., Kok, G., Gottlieb, N. H., & Fernandez, M. E. (2011). *Planning health promotion programs: an intervention mapping approach*. San Francisco: Wiley.
- Berry, J. O., & Meyer, J. A. (1995). Employing people with disabilities: Impact of attitude and situation. *Rehabilitation Psychology*, 40(3), 211-222, doi:10.1037/0090-5550.40.3.211.
- Blackman, I., & Chiveralls, K. (2011). Factors Influencing Workplace Supervisor Readiness to Engage in Workplace-Based Vocational Rehabilitation. *Journal of Occupational Rehabilitation*, 21(4), 537-546, doi:<http://dx.doi.org/10.1007/s10926-011-9297-1>.
- Bölte, S., Mahdi, S., de Vries, P. J., Granlund, M., Robison, J., Shulman, C., et al. (2017). The Gestalt of Functioning in Autism Spectrum Disorder: Results of the International Conference to Develop Final Consensus ICF Core Sets. Manuscript submitted for publication.
- Chen, J. L., Leader, G., Sung, C., & Leahy, M. (2015). Trends in Employment for Individuals with Autism Spectrum Disorder: a Review of the Research Literature. [journal article]. *Review Journal of Autism and Developmental Disorders*, 2(2), 115-127, doi:10.1007/s40489-014-0041-6.

- Cimera, R. E., & Cowan, R. J. (2009). The costs of services and employment outcomes achieved by adults with autism in the US. *Autism, 13*(3), 285-302, doi:10.1177/1362361309103791.
- Coster, W. J. (2013). Making the best match: Selecting outcome measures for clinical trials and outcome studies. [Conference Paper]. *American Journal of Occupational Therapy, 67*(2), 162-170, doi:10.5014/ajot.2013.006015.
- Department of Industry Innovation and Science (2016). Australian Industry Report 2016. (pp. 1-170). Canberra, ACT: Office of the Chief Economist, Department of Industry, Innovation and Science.
- Domzal, C., Houtenville, A., & Sharma, R. (2008). Survey of employer perspectives on the employment of people with disabilities: Technical report. (prepared under contract to the Office of Disability and Employment Policy, U.S. Department of Labor). McLean, Va: CESSI.
- Ellenkamp, J., Brouwers, E., Embregts, P., Joosen, M., & Weeghel, J. (2016). Work Environment-Related Factors in Obtaining and Maintaining Work in a Competitive Employment Setting for Employees with Intellectual Disabilities: A Systematic Review. *Journal of Occupational Rehabilitation, 26*(1), 56-69, doi:10.1007/s10926-015-9586-1.
- Erickson, W. A., von Schrader, S., Bruyère, S. M., & VanLooy, S. A. (2014). The Employment Environment: Employer Perspectives, Policies, and Practices Regarding the Employment of Persons With Disabilities. *Rehabilitation Counseling Bulletin, 57*(4), 195-208, doi:10.1177/0034355213509841.
- Gates, L., Akabas, S., & Kantrowitz, W. (1996). Supervisors' role in successful job maintenance: A target for rehabilitation counselor efforts. *Journal of Applied Rehabilitation Counseling, 27*(3), 60-66.
- Gates, L. B. (1993). The role of the supervisor in successful adjustment to work with a disabling condition: Issues for disability policy and practice. [Article]. *Journal of Occupational Rehabilitation, 3*(4), 179-190, doi:10.1007/BF01097428.
- Gilbride, D., Stensrud, R., Ehlers, C., Evans, E., & Peterson, C. (2000). Employers' attitudes toward hiring persons with disabilities and vocational rehabilitation services. [Article]. *Journal of Rehabilitation, 66*(4), 17-23.
- Gilbride, D., Stensrud, R., Vandergoot, D., & Golden, K. (2003). Identification of the characteristics of work environments and employers open to hiring and accommodating people with disabilities. *Rehabilitation Counseling Bulletin, 46*(3), 130-190.
- Glasman, L. R., & Albarracín, D. (2006). Forming attitudes that predict future behavior: A meta-analysis of the attitude behavior relation. *Psychological Bulletin, 132*(5), 778-822.
- Greenwood, R., & Johnson, V. A. (1987). Employer perspectives on workers with disabilities. [Review]. *Journal of Rehabilitation, 53*(3), 37-45.
- Hagner, D., & Cooney, B. (2003). Building employer capacity to support employees with severe disabilities in the workplace. *Work, 21*(1), 77-82.
- Hagner, D., & Cooney, B. (2005). "I do that for everybody": Supervising employees with autism. *Focus on Autism and Other Developmental Disabilities, 20*(2), 91-97, doi:10.1177/10883576050200020501.
- Hartnett, H. P., Stuart, H., Thurman, H., Loy, B., & Batiste, L. C. (2011). Employers' perceptions of the benefits of workplace accommodations: reasons to hire, retain and promote people with disabilities. *Journal of Vocational Rehabilitation, 34*(1), 17-23.
- Hendricks, D. (2010). Employment and adults with autism spectrum disorders: Challenges and strategies for success. *Journal of Vocational Rehabilitation, 32*(2), 125-134.

- Hernandez, B., Keys, C., & Balcazar, F. (2000). Employer attitudes toward workers with disabilities and their ADA employment rights: A literature review. *Journal of Rehabilitation, 66*(4), 4-16.
- Hernandez, B., & McDonald, K. (2010). Exploring the Costs and Benefits of Workers with Disabilities. *Journal of Rehabilitation, 76*(3), 15-23.
- Hillier, A., Campbell, H., Mastriani, K., Izzo, M. V., Kool-Tucker, A. K., Cherry, L., et al. (2007). Two-Year Evaluation of a Vocational Support Program for Adults on the Autism Spectrum. *Career Development for Exceptional Individuals, 30*(1), 125-134.
- Houtenville, A., & Kalargyrou, V. (2012). People with disabilities: Employers' perspectives on recruitment practices, strategies, and challenges in leisure and hospitality. [Article]. *Cornell Hospitality Quarterly, 53*(1), 40-52, doi:10.1177/1938965511424151.
- Houtenville, A., & Kalargyrou, V. (2015). Employers' Perspectives about Employing People with Disabilities: A Comparative Study across Industries. [Article]. *Cornell Hospitality Quarterly, 56*(2), 168-179, doi:10.1177/1938965514551633.
- IBM Corporation (2016). IBM SPSS statistics for Windows. (24.0 ed.). Armonk, New York: IBM Corporation.
- Jacob, A., Scott, M., Falkmer, M., & Falkmer, T. (2015). The Costs and Benefits of Employing an Adult with Autism Spectrum Disorder: A Systematic Review. *Plos One, 10*(10), e0139896, doi:10.1371/journal.pone.0139896.
- Ju, S., Roberts, E., & Zhang, D. (2013). Employer attitudes toward workers with disabilities: A review of research in the past decade. *Journal of Vocational Rehabilitation, 38*(2), 113-123.
- Kaye, H., Jans, L., & Jones, E. (2011). Why Don't Employers Hire and Retain Workers with Disabilities? *Journal of Occupational Rehabilitation, 21*(4), 526-536, doi:10.1007/s10926-011-9302-8.
- Kregel, J., & Tomiyasu, Y. (1992). General Scale: [Form B.] Joint project of the Rehabilitation Research and Training Center on Supported Employment at Virginia Commonwealth University. Richmond, Virginia: Richmond, Virginia, and Keio University, Tokyo, Japan.
- Kregel, J., & Tomiyasu, Y. (1994). Employers' attitudes toward workers with disabilities. *Journal of Vocational Rehabilitation, 4*(3), 165-173, doi:10.3233/JVR-1994-4305.
- Krieger, B., Kinebanian, A., Proding, B., & Heigl, F. (2012). Becoming a member of the work force: perceptions of adults with Asperger Syndrome. *Work, 43*(2), 141-157, doi:10.3233/WOR-2012-1392.
- Livermore, G., & Goodman, N. (2009). A review of recent evaluation efforts associated with programs and policies designed to promote the employment of adults with disabilities. Ithaca, NY: Cornell University, Rehabilitation Research and Training Center on Employment Policy.
- Lorenz, T., & Heinitz, K. (2014). Aspergers - Different, Not Less: Occupational Strengths and Job Interests of Individuals with Asperger's Syndrome. *Plos One, 9*(6), doi:10.1371/journal.pone.0100358.
- Luecking, R. G. (2008). Emerging employer views of people with disabilities and the future of job development. *Journal of Vocational Rehabilitation, 29*(1), 3-13.
- Marchand, E., Stice, E., Rohde, P., & Becker, C. B. (2011). Moving from efficacy to effectiveness trials in prevention research. [Article]. *Behaviour Research and Therapy, 49*(1), 32-41, doi:10.1016/j.brat.2010.10.008.
- Mawhood, L., & Howlin, P. (1999). The Outcome of a Supported Employment Scheme for High-Functioning Adults with Autism or Asperger Syndrome. *Autism, 3*(3), 229-254, doi:10.1177/1362361399003003003.

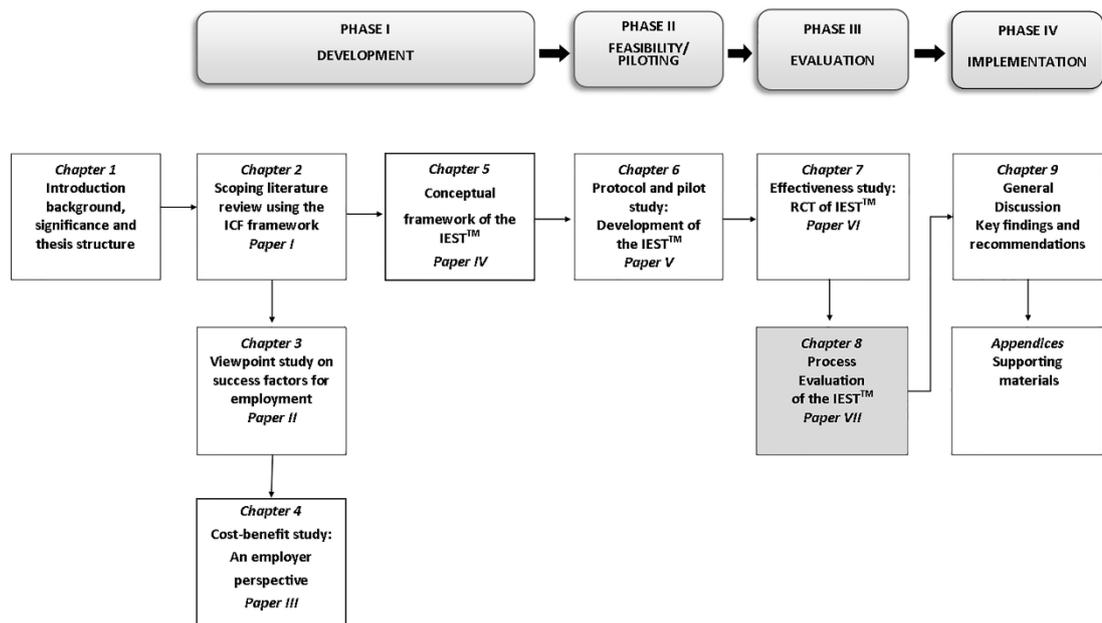
- McBride, N. (2016). *Intervention research: A practical guide for developing evidence-based school prevention programmes*. Singapore: Springer.
- McConachie, H., Parr, J. R., Glod, M., Hanratty, J., Livingstone, N., Oono, I. P., et al. (2015). Systematic review of tools to measure outcomes for young children with autism spectrum disorder. [Article]. *Health Technology Assessment, 19*(41), 1-538, doi:10.3310/hta19410.
- Morgan, R. L., & Alexander, M. (2005). The employer's perception: employment of individuals with developmental disabilities. *Journal of Vocational Rehabilitation, 23*(1), 39-49.
- Organisation for Economic Co-operation and Development (OECD) (2010). *Sickness, Disability and Work: Breaking the Barriers* (A synthesis of findings across OECD countries). Paris: OECD Publishing.
- Portney, L. G., & Watkins, M. P. (2009). *Foundations of Clinical Research: Applications to Practice* (3rd ed.). Upper Saddle River: New Jersey: Pearson: Prentice Hall.
- Qualtrics (2005). Qualtrics (November 2015 ed., Vol. 2015). Provo, Utah, USA: Qualtrics.
- Rashid, M., Hodgetts, S., & Nicholas, D. (2017). Building Employers' Capacity to Support Vocational Opportunities for Adults with Developmental Disabilities. [Article]. *Review Journal of Autism and Developmental Disorders, 4*(2), 165-173, doi:10.1007/s40489-017-0105-5.
- Roux, A. M., Shattuck, P. T., Cooper, B. P., Anderson, K. A., Wagner, M., & Narendorf, S. C. (2013). Postsecondary employment experiences among young adults with an autism spectrum disorder. *Journal of the American Academy of Child & Adolescent Psychiatry, 52*(9), 931-939, doi:<http://dx.doi.org/10.1016/j.jaac.2013.05.019>.
- Russo, R. J. (1999). Applying a strengths-based practice approach in working with people with developmental disabilities and their families. [Article]. *Families in Society, 80*(1), 25-33.
- Schneidert, M., Hurst, R., Miller, J., & Ustun, B. (2003). The role of Environment in the International Classification of Functioning, Disability and Health (ICF). *Disability and Rehabilitation, 25*(11-12), 588-595.
- Schulz, K. F., Altman, D. G., & Moher, D. (2010). CONSORT 2010 Statement: updated guidelines for reporting parallel group randomized trials. *Open Medicine, 4*(1), e60-e68.
- Scott, M., Falkmer, M., Girdler, S., & Falkmer, T. (2015). Viewpoints on Factors for Successful Employment for Adults with Autism Spectrum Disorder. *Plos One, 10*(10), e0139281, doi:10.1371/journal.pone.0139281.
- Scott, M., Jacob, A., Hendrie, D., Parsons, R., Girdler, S., Falkmer, T., et al. (2017). Employers' perception of the costs and the benefits of hiring individuals with autism spectrum disorder in open employment in Australia. *Plos One, 12*(5), 1-16, doi:e0177607. <https://doi.org/10.1371/journal.pone.0177607>.
- Sheeran, P., Maki, A., Montanaro, E., Avishai-Yitshak, A., Bryan, A., Klein, W. M. P., et al. (2016). The impact of changing attitudes, norms, and self-efficacy on health-related intentions and behavior: A meta-analysis. [Article]. *Health Psychology, 35*(11), 1178-1188, doi:10.1037/hea0000387.
- Smith, K., Webber, L., Graffam, J., & Wilson, C. (2004). Employer satisfaction with employees with a disability: Comparisons with other employees. *Journal of Vocational Rehabilitation, 21*(61-69).
- Unger, D. (2002). Employers' Attitudes Toward Persons with Disabilities in the Workforce: Myths or Realities? *Focus on Autism and Other Developmental Disabilities, 17*(1), 2-10, doi:10.1177/108835760201700101.

- Unger, D. (2007). Addressing employer personnel needs and improving employment training, job placement and retention for individuals with disabilities through public-private partnerships. *Journal of Vocational Rehabilitation, 26*(1), 39-48.
- Unger, D., & Kregel, J. (2003). Employers' knowledge and utilization of accommodations. *Work, 21*(1), 5-15.
- United Nations (2006). Conventions on the rights of persons with disabilities and optional protocol. New York: United Nations.
- Wantland, D. J., Portillo, C. J., Holzemer, W. L., Slaughter, R., & McGhee, E. M. (2004). The effectiveness of web-based vs. non-web-based interventions: A meta-analysis of behavioral change outcomes. [Review]. *Journal of Medical Internet Research, 6*(4).
- Wehman, P., Schall, C. M., McDonough, J., Graham, C., Brooke, V., Riehle, J. E., et al. (2016). Effects of an employer-based intervention on employment outcomes for youth with significant support needs due to autism. *Autism, 1-15*, doi:10.1177/1362361316635826.
- World Health Organization (2001). *International Classification of Functioning, Disability and Health*. Geneva: WHO.

Chapter 8: Paper VII-Process evaluation of the IEST™

Preface

Chapter 8 emphasizes the important of understanding the process of implementation, the mechanism of impact and the context of the intervention through conducting a process evaluation. Process evaluations are an underutilised resource in connecting research and practice. This chapter explains whether the IEST™ was considered effective by exploring the complexities involved in evaluating the effectiveness of an intervention in the context of real world settings



This manuscript is currently under review. Due to copyright restrictions only, the **pre-print** version has been included in the thesis as a typescript. Please note, copyright remains with the journal.

Scott M, Falkmer, M., Kuzminski, R., Falkmer, T., & Girdler, S. Process evaluation of a randomised controlled trial evaluating an autism-specific workplace tool for employers. Journal for Autism and Developmental Disorders 2018; Under review.

Process evaluation of a randomised controlled trial evaluating an autism-specific workplace tool for employers

Melissa Scott^{1,2}, Marita Falkmer^{1,2,3}, Rebecca Kuzminski¹, Torbjörn Falkmer^{1,2,4} and
Sonya Girdler^{1,2}

¹School of Occupational Therapy and Social Work, Curtin University, Perth,
Australia.

² Cooperative Research Centre for Living with Autism (Autism CRC), Brisbane,
Australia,

³School of Education and Communication, CHILD programme, Institute of
Disability Research, Jönköping University, Jönköping, Sweden

⁴ Rehabilitation Medicine, Department of Medicine and Health Science (IMH),
Linköping University, Linköping, Sweden

Corresponding author:

Melissa Scott, School of Occupational Therapy and Social Work, Curtin University,
GPO Box U1987, Perth, Australia.

Email: melissa.scott@curtin.edu.au

Conflict of interest: The authors declare that they have no conflict of interest.

Abstract

The effectiveness of the Integrated Employment Success Tool (IEST™) developed to improve employers' skills in modifying the workplace for individuals on the autism spectrum, was established in a prior randomised controlled trial. The process evaluation was conducted to determine the effectiveness of implementation, usability and related barriers and facilitators of the IEST™. Employers (N=29) provided their feedback via an online questionnaire. Of these, 11 participants were interviewed, further exploring their experiences. Data were analysed via descriptive statistics and thematic analysis. Three themes emerged: A 'go-to guide' empowering employers; seeing the workplace from a different perspective; and a structured approach to supporting employees on the autism spectrum. The process evaluation provided an in-depth understanding as to why the IEST™ was effective.

Keywords

Autism spectrum disorder, complex intervention, hiring, process evaluation, work environment

Introduction

Despite adults on the autism spectrum having both the desire and ability to work, they continue to experience many barriers in their attempts to secure and maintain employment (Hendricks 2010; Chen et al. 2015a). While some of these barriers to employment result directly from the cardinal features of autism, including difficulties in social communication, their desire for routine and structure, and unusual or repetitive behaviours (American Psychiatric Association 2013; Leonard et al. 2010), there are many barriers beyond those which require consideration (Scott et al. 2015; Lorenz et al. 2016). While vocational support services, including job-matching, assistance with the job application process, providing on-the-job training and implementing necessary accommodations, have assisted some people on the autism spectrum in finding employment in the competitive workforce (Lawer et al. 2009; Hillier et al. 2007; Migliore et al. 2014; Nicholas et al. 2014; Müller et al. 2003), many remain unemployed (Chen et al. 2015b). In Australia, the unemployment rate for people on the autism spectrum is 31%, in comparison to 10% of all individuals with disabilities, and 5% for individuals without disabilities (Australian Bureau of Statistics 2015). The continued high rates of unemployment for this group indicate that vocational support services alone are not sufficient in achieving successful employment, suggesting that critical components in the employment process may have been overlooked. It is likely that employers have much to contribute in supporting the development of more inclusive and diverse work environments (Rashid et al. 2017; Erickson et al. 2014).

Employers are a key external environmental factor in the employment process, with their attitudes, management practices and policies critical in facilitating or hindering the work participation of individuals on the autism spectrum (Unger

2002; Erickson et al. 2014). Despite employers holding educational, supportive and administrative responsibilities for employees on the autism spectrum, their role in the employment process remains poorly understood (Gates 1993). While employment management practices such as flexibility in adjusting work tasks, providing practicable workplace accommodations, applying or withdrawing supports as needed and cultivating a workplace climate and culture for inclusion and diversity have been associated with improved employment outcomes (Hagner and Cooney 2005; Scott et al. 2015; Erickson et al. 2014), employers remain largely an untapped resource in the work environment. This is a substantial oversight given their potential to influence hiring decisions, create employment opportunities and provide effective support to individuals on the autism spectrum (Kaye et al. 2011; Gates 1993). However, many employers feel unprepared and lack the confidence and knowledge needed to effectively support employees on the autism spectrum (Unger and Kregel 2003; Gates et al. 1996). If employers are to become a key facilitator in the process of improving the employment outcomes, education is an essential tool with the potential to increase employers' knowledge and skills to improve their attitudes towards supporting these employees (Howlin et al. 2005; Scott et al. 2015; Vogeley et al. 2013), and encourage a collaborate approach and dialogue in meeting the unique needs of autism (Mautz et al. 2001; Mank et al. 1997; Rogan et al. 2000). Educating employers also reduces the needs for ongoing external support from disability employment service providers, who commonly withdraw their support after the prescribed, funded period (Gates 1993; Migliore et al. 2014).

A paucity of literature exists examining employers' capacity to support individuals on the autism spectrum in the workplace (Hagner and Cooney 2003; Rashid et al. 2017; Unger 2007). Given the significant role that employers play in

recruiting and hiring, and providing ongoing support to employees, they remain under supported and overlooked in their capacity to provide support (Unger 2007). In response to the need to address limitations in current approaches to disability employment support for people on the autism spectrum, the Integrated Employment Success Tool (IEST™) was developed specifically for employers. The IEST™ is an autism-specific workplace tool aimed at enhancing employers' confidence, knowledge and attitudes towards modifying the work environment to meet the unique needs of individuals on the autism spectrum. The Medical Research Council framework (MRC) for complex interventions underpinned the development and evaluation of the IEST™ (Medical Research Council 2008), drawing from the theoretical frameworks of self-efficacy theory (Bandura 1977), and the International Classification of Functioning, Health and Disability (ICF) framework (World Health Organization 2001). The effectiveness of the IEST™ was established in a randomised controlled trial (RCT) (Scott. et al. 2018).

While RCTs are useful in evaluating the effectiveness of an intervention, they are predominantly focused on prespecified outcomes and not on the process involved in implementing the intervention (Oakley et al. 2006). In order to comprehensively understand a complex intervention, such as the IEST™, the MRC framework recommends conducting a process evaluation (Medical Research Council 2008). A process evaluation is useful in interpreting the outcomes of a RCT, providing valuable insight into the success or failure of an intervention and recommendations for improvement (Moore et al. 2015). Process evaluations assist in determining the fidelity and quality of intervention implementation, clarifying causal mechanisms of the intervention that produce change, and identifying and interpreting contextual factors that may act as barriers or facilitators in the implementation of the

intervention (Moore et al. 2015). They are also particularly useful in multisite trials, where the IEST™ may have been implemented and received differently across work environments (Oakley et al. 2006).

Aims

As such, the primary objectives of the process evaluation were to: i) describe employers' experiences of using the IEST™ in their workplace; ii) describe employers' perceptions of the usability of the IEST™; iii) explore the features of the IEST™ contributing to change in the workplace, including recommendation for improvements; and iv) identify the perceived barriers and enablers in using the IEST™.

Methods

Design

As guided by the MRC framework, a mixed-methods process evaluation was conducted to obtain feedback from employers using online questionnaires and semi-structured interviews, as an adjunct to the RCT study evaluating the effectiveness of the IEST™ (Medical Research Council 2008). Details of the RCT findings have been reported elsewhere (Scott. et al. 2018)

Participants

Employers were eligible to participate if they were living in Australia; had adequate English to read and comprehend the IEST™ manual; and currently employed at least one adult on the autism spectrum who self-identified as having Asperger's syndrome (AS), high functioning autism (HFA) or autism, reportedly meeting the DSM-IV criteria for autism spectrum disorder (ASD) (American Psychiatric Association 2000). Employees on the autism spectrum were required to be over the age of 18 and working in open or supported paid employment in full-

time, part-time or casual positions. Due to this study evaluating the processes underpinning the implementation of the IEST™, only participants who were randomly allocated to the IEST™ intervention group of the RCT were included (Scott. et al. 2018).

In total, 29 participants were included and completed the online questionnaires providing feedback on the IEST™. Participant and organisation characteristics are presented in Table 1. The industry distribution of participants was broad, with health care and social assistance (27%) , financial and insurance services (14%) and manufacturing (10%) being most prevalent, and representative of the size and industry type of Australia generally (Department of Industry Innovation and Science 2016). More than 60% of participants were employed with their organisation for more than four years, and overall, only 34% of participants had any previous experience and exposure working with employees with a disability.

Table 1. Characteristics of participants and their associated organisations (N=29)

	<i>n</i> (%)
Gender	
Male	18 (62%)
Female	11 (38%)
Age	
21-34	7 (24%)
35-44	11 (38%)
45+	11 (38%)
Organisation size ^a	
Small (1-49 employees)	13 (45%)
Medium (50-250 employees)	8 (28%)
Large (>250 employees)	7 (24%)
Job role in relation to employee on the autism spectrum ^a	
Manager	12 (41%)
Supervisor	8 (28%)
Colleague	8 (28%)
Experience supporting employees on the autism spectrum ^a	
Less than year	10 (34%)
1-2 years	6 (21%)
3-4 years	4 (14%)
More than 4 years	6 (21%)

^a*Excludes missing cases*

A subgroup of participants who completed the online questionnaire were invited to take part in an interview to provide further insight into their experiences of using the IEST™ in their specific work environment. Purposive sampling was utilised to select the participants (Portney and Watkins 2009), particularly those responding, in comparison to those not responding to the intervention. High responders (HR) were participants identified as exhibiting marked gains from the intervention, while low responders (LR) exhibited little to no improvement (Choque Olsson et al. 2016). Responders were defined by their changes on the RCT study's primary outcome measure, the Employer Self-Efficacy Scale (ESES) (Scott. et al. 2018). The ESES measures employers' self-efficacy in supporting employees on the autism spectrum across the employment process and provides a calculated overall score, with a higher total score indicative of higher self-efficacy. The score can be anything from 20 to 200.

In total, 11 interviews were conducted before data saturation was reached, with no new codes, categories or themes identified (Fusch and Ness 2015). Interview participant characteristics are presented in Table 2. Five participants were classified as HR and six as LR according to their pre-post ESES total score change. The HR demonstrated positive individual changes between 17% and 28% on the ESES total score, while LR revealed either a decrease or a maximum increase of 10%.

Table 2. Characteristics of high and low responders from the subgroup of interview participants ($n=11$)

Participant	Gender	State	Job role in relation to employee on the autism spectrum	Number of employees on the autism spectrum	DES provider support	Diff. ESES total score Pre-post	Pre- ESES total score
HR 1	F	QLD	Manager	2	No	36	125
HR 2	F	WA	Manager	1	Yes	25	96
HR 3	M	WA	Supervisor	3	No	23	132
HR 4	M	WA	Manager	1	Yes	17	133
HR 5	M	WA	Mentor	3	No	16	152
LR 6	M	VIC	Supervisor	1	No	10	139
LR 7	M	NSW	Manager	1	Yes	3	133
LR 8	F	WA	Manager	3	No	2	105
LR 9	M	WA	Manager	1	Yes	-1	123
LR 10	M	WA	Manager	2	Yes	-16	197
LR 11	M	WA	Manager	2	Yes	-33	192

Note. DES provider: Disability Employment Service provider; Diff. ESES: Difference between Employer Self-Efficacy Scale pre-and-post scores; HR: High responder; LR: Low responder; F: Female; M: Male; QLD: Queensland; WA: Western Australia; VIC: Victoria; NSW: New South Wales

Intervention

In accordance with the MRC framework, a multifaceted needs assessment was conducted (Medical Research Council 2008), informing the development of the IEST™ intervention and highlighting the importance of the environment in supporting employment outcomes for individuals on the autism spectrum (Figure 1) (Scott. et al. 2018) The development of the IEST™ recognised the utility of an intervention targeting employers, empowering them to manage the physical, social and attitudinal work environments by enhancing their confidence and skills to implement workplace modifications tailored to the needs of their employees on the autism spectrum (Scott et al. 2015; Scott et al. 2017). The IEST™ intervention is a practical, autism -specific workplace manual developed for employers to assist them in hiring, supporting and retaining employees on the autism spectrum. The purpose of the IEST™ is to increase employers' awareness and understanding of autism, including highlighting the strengths of employees on the autism spectrum, to assist employers in identifying potential environmental workplace challenges and to

provide strategies, recommendations and modifications required to assist and resolve the environmental workplace challenges encountered by employees on the autism spectrum. The IEST™ was packaged as either a paper-based version or interactive PDF. It comprised of a series of eight modules containing autism-specific information, checklists and goal setting activities, workplace modification strategies and additional work-related resources. Five modules specifically addressed each phase of the employment process including, *advertising the job, the interview, job commencement and placement, workplace modifications* and providing *ongoing support*. The IEST™ was implemented in the employers' work environments, whereby they were instructed to use those aspects of the IEST™ most relevant to the needs of their employee on the autism spectrum and their workplace. A prescribed 'dosage' of the IEST™ for employers was not feasible given the unique and varying needs of employees on the autism spectrum and the organisational differences likely to exist between work environments.

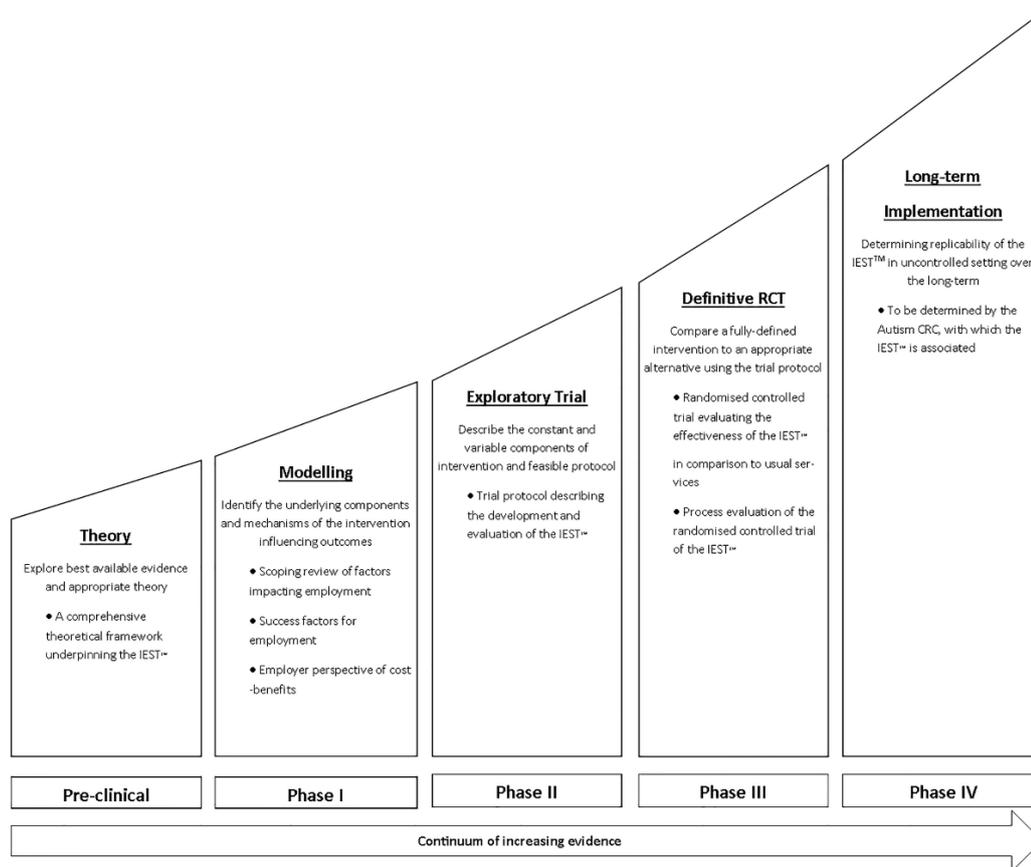


Figure 1. Sequential phases of developing and evaluating complex interventions such as the IEST™

Data collection

Quantitative

A brief, structured online questionnaire was developed obtaining information from employers at the end of the trial relating to their usage and overall satisfaction with the IEST™.

Qualitative

A series of semi-instructed interviews were conducted over the telephone by an independent researcher with participants following their completion of the trial (Tourangeau and Yan 2007), supplementing the quantitative data and enriching the interpretation of experiences using the IEST™ in their specific work environment. The interviews lasted between 20 and 30 minutes. An interview guide was developed

with 10 open-ended questions addressing participants' experiences using the IEST™, identified barriers and facilitators impacting implementation and recommendations for improvement. This was applied in a flexible manner allowing for opportunities to digress and ask follow-up questions (Appendix A). Saturation was reached after 11 interviews, when no new ideas, concepts, patterns and themes emerged (Fusch and Ness 2015).

Data analyses

For quantitative data, descriptive statistics were used to determine participants' usage and satisfaction with the IEST™ in their workplace. For qualitative data, all interviews were audio recorded, transcribed verbatim and de-identified. Data were exported to Nvivo for thematic analysis (NVivo 2015). Thematic analysis was conducted according to the six phases (Braun and Clarke 2006): 1) familiarisation with transcribed data by four researchers; 2) generation of nodes by two independent researchers, with the extraction of significant nodes for further analysis. Extracted nodes were reviewed by a third researcher and any uncertainties were discussed until consensus was reached; 3) identification of broad themes by grouping categorised nodes; 4) reviewing themes for refinement by grouping and collapsing similar themes and discarding inconsistent themes; 5) defining and finalising theme names by the primary researcher, that were later reviewed and verified by other two researchers and; 6) themes were compared for similarities and differences between HR and LR.

To establish trustworthiness, multiple data collection methods were used including a structured online questionnaire with both multiple choice and open-ended questions, and verbal interviews. Data were further triangulated with multiple researchers analysing the data transcripts and refining themes to create a rich

description of participants' experiences (Taylor 2007). An audit trail recorded the coding decisions, data analysis, and the critical thinking processes. A reflexive journal was kept during the RCT, allowing the first author to document personal feelings, ideas and assumptions in relation to the data, which was then examined by the research team to ensure it had not been influenced by personal biases (DePoy and Gitlin 2005).

Ethics

An electronic information letter briefly outlining the purpose of the study was sent to participants in the IEST™ group of the RCT (Scott. et al. 2018). Prior to interview commencement, informed consent was obtained from all individual participants included in this study. Data collected from the study were de-identified and securely stored to maintain confidentiality and privacy of participants. Ethical approval was obtained from the university's Human Research Ethics Committee. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Results

Quantitative data

Participants' varied usage of the IEST™ reflected the instruction given to employers prior to the intervention to use it, 'According to the needs of their employee on the autism spectrum', with only 20% of participants using the IEST™ on a regular weekly to fortnightly basis, 41% using it once or monthly, with more than one third of participants reporting not having used it at all (Table 3). Although participants' usage of the IEST™ varied, 65% were satisfied to very satisfied using and implementing it in their workplace and only 7% indicating their dissatisfaction.

A quarter of the participants chose the neutral option to indicate their satisfaction as they had not used the IEST™ at all in their workplace and could not fairly respond to this question. While 24% of participants indicated that they were the only person in their workplace utilising the IEST™, 62% of participants including both regular and intermittent users, had recommended the IEST™ to either another manager, supervisor, co-worker or mentor in their workplace. Interestingly, 14% of participants had recommended the IEST™ to their respective disability employment service (DES) provider. Several participants indicated their preference for a purely paper-based (10%) or web-based (20%) version of the IEST™, however 69% of participants indicated that both an online and paper-based version would be more beneficial, providing employers with a choice depending on their personal preference or work content.

Table 3. Participant feedback on IEST™ in their respective workplaces (N=29)

	<i>n</i> (%)
IEST™ Usage	
Not at all	11 (38%)
Weekly	3 (10%)
Fortnightly	3 (10%)
Monthly	9 (31 %)
Once	3 (10%)
Recommended to others	
Manager	8 (28%)
Supervisor	1 (3%)
Co-worker	7 (24%)
Mentor	2 (7%)
Disability employment service provider	4 (14%)
No one else	7 (24%)
Satisfaction with IEST™	
Very dissatisfied	2 (7%)
Neutral	8 (28%)
Satisfied	14 (48%)
Very satisfied	5 (17%)
Preferred IEST™ format	
Paper-based	3 (10%)
Web-based	6 (21%)
Both	20 (69%)

Qualitative data

Data analysis revealed that participants' experiences using the IEST™ could be described according to three major themes: A 'go-to guide' empowering employers; seeing the workplace from a different perspective; and a structured approach to supporting employees on the autism spectrum (Figure 2). Thematic analysis revealed that both HR and LR had similar experiences using the IEST™ in their respective workplaces, but differed in the amount and details provided regarding the impact of the IEST™ on their behavioural change.

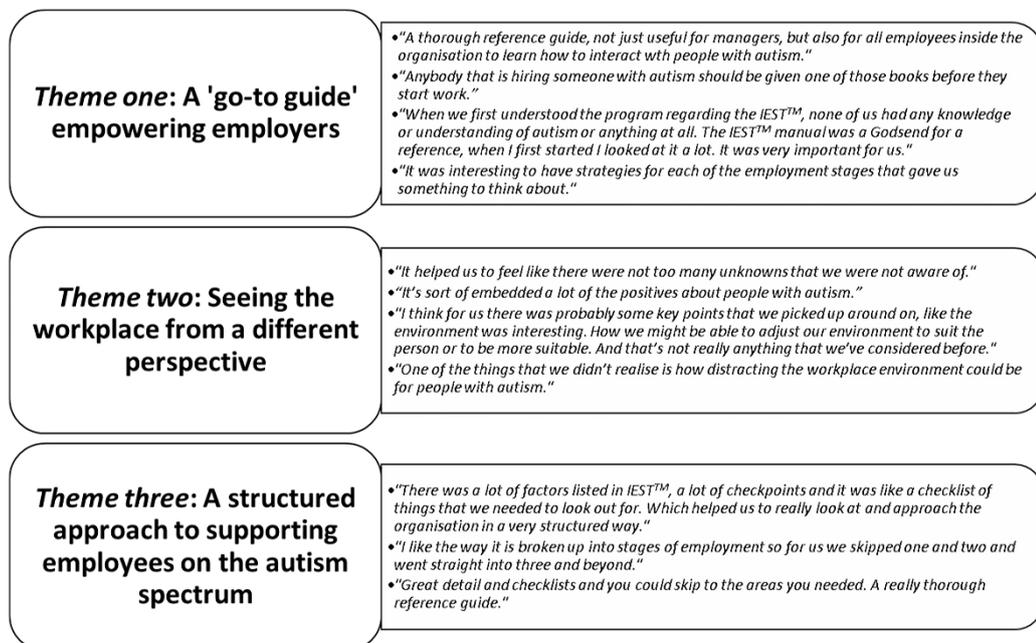


Figure 2. Summary of participants' experiences using the IEST™

Theme one: A 'go-to guide' empowering employers

HR reported greater usage and implementation of the IEST™ in their workplace compared to LR, who were more likely in part to have an already modified workplace due to their association with a DES provider. Regardless of participants' access to external support, both HR and LR considered the IEST™ to be

a useful and informative tool in their respective work environments. Participants described the IEST™ as a “good fit”, “a really thorough reference guide” and “not just useful for managers, but also for all employees inside the organisation to learn how to interact with people with autism” (HR 3) in Table 2. Similar references will be made from here on. The IEST™ comprised of eight modules and was described as a unique and helpful resource providing a variety of support strategies that could be used across the employment process:

I would say the IEST™ was most helpful in preparing the person [HR manager] for the interview and the interview process itself, in terms of adjusting the recruitment process and sort of the induction process etc. (LR 6).

It was interesting to have strategies for each of the employment stages that gave us something to think about (LR 7).

I think it just provides a good resource to come back to as we’re working through processes around employment, so yeah. I mean there’s no real guide about how to employ anyone in those other areas of disability or anyone like that. So, I think the IEST™ is so specific and detailed. Yeah, it’ll be really helpful (HR 1).

Interestingly, participants reported that the IEST™ was most effective in explaining autism, with frequent reference to module two, “*Information on autism*”. Participants’ knowledge and understanding of autism improved considerably, “it gave me more knowledge on how to help him” (HR 2), particularly in relation to their employee’s characteristics, such as their differences in communication and sensory sensitivities and their subsequent workplace behaviours. LR 10 reported, “There’s a lot of information that we weren’t told and you’re not told. But I found

that in the IEST™ book. I didn't know about it, about autistic people and what affects them and this and that, you know?". Many participants described that prior to using the IEST™, they lacked the awareness and understanding of how the work environment itself could be a potential barrier to their employees on the autism spectrum, potentially influencing their work participation, such as the loud noises, disruptive workplaces and changeable work spaces:

When we first started we had a young 16-year-old guy in here and we didn't know, but he had a problem because our computers can be quite loud, and he kept putting tissues in his ears. We had to address this problem and we didn't know what was going on here. He said, "Oh, it's just the loudness of the machine." Now, I didn't find that out until I read the IEST™ book that there's some certain little sounds and certain pitches of sounds that can affect them. So yeah, that book you gave us the next step to put a plan into action (LR 10).

While the IEST™ improved participants' knowledge, it also contributed to their confidence in supporting their employees on the autism spectrum by empowering to communicate effectively, adjust their support approaches, implement specific workplace modifications and even educate their co-workers on autism:

It definitely helped with communication and also making me more confident about how I was interacting with them [employees on the autism spectrum] and the teams, as well. If I heard somebody talking about not being in a general conversation away from the interns [employees on the autism spectrum], they would come up with their preconceived ideas of how things were. I would go read up on it and confidently go out and say, "This is

wrong, this is how it is, and you have to treat each one on a case by case basis, just like anybody” (LR 8).

Overall, both HR and LR responders agreed that although the IEST™ was effective in their workplaces, it would be most beneficial for employers new to the employment process in hiring and supporting an employee on the autism spectrum. The IEST™ guided many participants in this study with no previous autism-related experience, with HR 2 reporting that, “The IEST™ exceeded my needs because if I didn’t have that tool then I would’ve been blind, I wouldn’t have understood anything”, and LR 11 stating that, “Anybody that is hiring someone with autism should be given one of those books before they start work”. Participants also referred to the IEST™ as “the go-to guide for autism” and “a good safety blanket, so you felt even if something wasn’t going wrong you always had it as a ‘go-to’ if you really needed to” (LR 8):

When we first understood the program regarding the IEST™, none of us had any knowledge or understanding of autism or anything at all. The IEST™ manual was a Godsend for a reference, when I first started I looked at it a lot. It was very important for us (HR 5).

Several participants reported that the IEST™ improved their ability to provide timely support to their employee on the autism spectrum and that they were less reliant on DES providers for workplace support:

Yeah well, it saved us a lot of time you know, by the time you rang the person at the autism association and all that and then they got back to you and all that stuff. It was actually quicker to have a quick flick through the book and find out what it was (LR 11).

Theme two: Seeing the workplace from a different perspective

The use of the IEST™ encouraged the majority of participants (both HR and LR) to reassess their perceptions of traditional support approaches and instead, provide a structured and systematic process of workplace support of their employees on the autism spectrum. The IEST™ challenged participants to reframe their thinking processes, prompting them to query the success of their current supports and modifications, to consider if they had overlooked anything in relation to their employee, and highlighting areas where their knowledge was lacking:

It helped us to feel like there were not too many unknowns that we were not aware of. The process itself, there's obviously thinking like was there anything we should know that we don't know about autism and at least we felt like we have the most important stuff covered and we have done our due diligence and hopefully if we follow the guidelines we know we should be okay (LR 6).

Participants perceived the IEST™ as promoting a strengths-based approach in providing support to employees on the autism spectrum, with LR 8 stating, "It's sort of embedded a lot of the positives about people with autism", while also providing information on new support strategies. Some participants supported by DES providers described the IEST™ as a complimentary tool to their current practices, as assisting them in developing and implementing new approaches and promoting new perspectives. For some participants, the IEST™ also highlighted the possibility of using the work environment itself as tool and resource that could be modified for successful employment for individuals on the autism spectrum:

Yeah so, I think for us there was probably some key points that we picked up around on, like the environment was interesting. How we might be able to

adjust our environment to suit the person or to be more suitable. And that's not really anything that we've considered before (HR 1).

Okay. So, one of the things that we didn't realise is how distracting the workplace environment could be for people with autism. So, providing people with autism with their own space that's out of the way of distraction and loud noises is something we've done within the organisation to make work possible (HR 3).

Theme three: A structured approach to supporting employees on the autism spectrum

Participants' (both HR and LR) interpretation of the barriers and facilitators of the IEST™ varied according to their work environments. Overall, the IEST™ was described as an accessible, comprehensible and easy to navigate resource that could be used at a self-regulated pace according to workplace demands and employee needs. Several participants reported that the layout, the grouping of concepts and employment phases, assisted in the flow and readability of information, while the use of online video tutorials and pre-established checklists facilitated opportunities for setting goals and structuring and prioritising tasks:

There was a lot of factors listed in IEST™, a lot of checkpoints and it was like a checklist of things that we needed to look out for. Which helped us to really look at and approach the organisation in a very structured way (HR 3).

I like the way it is broken up into stages of employment so for us we skipped one and two and went straight into three and beyond. To be honest even for people without autism it is an amazing employment guide, most people need all these ticked off the list, not just people with autism. Great detail and

checklists and you could skip to the areas you needed. A really thorough reference guide (LR 7).

In addition, several participants reported the potential use of the IEST™ as an ongoing reference guide or training manual for new or other staff members, who may be working with employees on the autism spectrum across work-related projects:

We have just started a second lot of interns who are on the autism spectrum, just now. I'm mentoring the new mentors and the first thing we did was give them the IEST™ manual to read and let them know it's a reference. It's an ongoing document that we really appreciate and really use (HR 5).

One of the key barriers affecting the success of the IEST™ was its length and format. Participants reported the 90-page manual was “daunting” and “unrealistic” to read through in the context of a busy work environment. One participant, LR 6 stated that, “It's not a very practical idea to give an employee a 100-page guide and say please read through this because you will be working with someone who is autistic. That's just not an option.” Participants proposed additional formats of the IEST™, suggesting the use of “summary sheets”, a more succinct version or an electronic adaptation. The extensive content of the IEST™ was also a barrier to several participants who would have preferred a “cheat sheet” for daily use supporting them to recognise the signs of anxiety, support social interaction, and providing them with knowledge on how to manage the stress and anxiety levels of their employees on the autism spectrum:

Maybe like a one-page document with bullet points of these are the challenges [employees on the autism spectrum] face, this is how you can tell they are struggling or uncomfortable, and these are the things you can do to make them comfortable (LR 6).

Several participants also noted that while the IEST™ was comprehensive, it lacked the detail required to meet the specific circumstantial needs of various industries, workplaces and employees on the autism spectrum. This barrier was also evident in the varying differences in the characteristics and behaviours of employees on the autism spectrum supported by participants, with the IEST™ designed to provide an overview of autism in the workplace with limited tailoring towards individuals circumstances:

Although it was thorough and covered a lot of ground, when we had a specific issue we also needed more details. There were things that quickly went beyond what the manual recommended (LR 7).

The IEST™ is laid out to tell you what you may come across, but every person is different so sometimes you may read and be expecting something and it doesn't happen (LR 8).

The barrier of developing and refining a tool specific to autism, a condition that spans a spectrum, while simultaneously tailoring the IEST™ generically to all work environments continues to be a challenge. Lastly, several participants cited time as a barrier, with LR 9 reporting “I'm just too busy” to successfully implement the IEST™ in their workplace.

Discussion

This process evaluation highlighted the effectiveness of the IEST™ in increasing employers' knowledge and confidence in supporting employees on the autism spectrum. This study further assisted in the interpretation of the RCT findings providing important insights into the perceived effectiveness and the barriers and facilitators in implementing the IEST™ in a variety of work environments. While a

process evaluation is often considered an underutilised resource in connecting research and practice, it was critical in understanding the complexities involved in evaluating the effectiveness of IEST™ in the context of real world settings (Evans et al. 2015).

Participants, both HR and LR in this study reported, similar experiences in using the IEST™ differing only in the amount and detail reported. The process evaluation revealed that the main benefit of the IEST™ was in increasing employers' knowledge and understanding of autism in the workplace, providing clarity in relation to autism-related traits and associated workplace behaviours. It was evident that the more employers knew about autism, the more confident they felt about approaching their employee to discuss their needs. Employer confidence is considered a key factor in identifying and implementing appropriate and effective workplace modifications (Unger and Kregel 2003). This was facilitated by the structure and layout of the IEST™, which systematically organised the content into modules each containing instructions addressing stages of the employment process, with checklists to prompt their thinking processes and structure their decision-making criteria. The IEST™ also assisted in increasing employers' awareness of the work environment itself as an inexpensive, readily available and sustainable resource that could be modified to improve employment outcomes for employees on the autism spectrum (Unger 1999; Scott et al. 2017). This increased awareness may also be helpful in mitigating employer perceptions of the unknown additional costs of employing individuals on the autism spectrum, in relation to workplace modifications and additional supervision and training (Hartnett et al. 2011; Hernandez and McDonald 2010). Findings from this study support the notion that increasing knowledge and confidence using an education-based intervention, such as

the IEST™, increases employers' capacity to problem-solve workplace difficulties and implement effective autism-specific support strategies (Rashid et al. 2017; Hagner and Cooney 2003).

The majority of participants were satisfied with the IEST™, considering it a useful tool, well-suited to their work environments. While participants described varying benefits in relation to their use of the IEST™ in supporting employees on the autism spectrum, many indicated that the IEST™ would be most beneficial to employers with no previous autism-related experience and those without support from a DES provider. Inexperienced employers are often hesitant to hire individuals with autism, feeling they lack autism-specific knowledge and are unprepared and uncertain of how to accommodate and support their workplace needs (Morgan and Alexander 2005; Unger and Kregel 2003; Hagner and Cooney 2003). Employers play a critical role in the hiring decisions of prospective employees (Unger 2002). If employment rates for individuals on the autism spectrum are to increase, then employers need to be effectively equipped to provide appropriate support (Gilbride et al. 2003). Findings suggest that presenting potential employers with the IEST™ prior to engaging in the process of employing someone on the autism spectrum will provide them with the opportunity to increase their autism-specific knowledge. In addition, participants currently receiving external support indicated that DES providers themselves would likely benefit from using the IEST™ in their own practices. In Australia, DES providers play an important role in the recruitment, placement and provision of ongoing support of individuals with a disability. However, many DES providers are generalists, lacking an in-depth understanding of the workplace needs specific to people on the autism spectrum, relying instead on generic disability support, knowledge and strategies (Howlin et al. 2015; Lattimore et

al. 2006). As a result, both employees on the autism spectrum and their employers' needs are often overlooked and under supported (Richards 2012). A tool such as the IEST™ may be beneficial beyond the scope of the employer.

More than one third of participants indicated that they did not use the IEST™ at all, with only 20% reporting using it on a regular weekly to fortnightly basis. Many participants cited time constraints as a barrier preventing them from implementing the IEST™ in their workplace. While this may be a valid explanation given employers are recognised as a time-poor population, another possible explanation is the length and format of the IEST™. Participants indicated that the IEST™ was impractical, with an unrealistic expectation that employers would have the time to read through a comprehensive guide to gain the necessary autism-related support strategies. Employers benefit from resources that are informative, practical and cost-effective, which can also immediately be implemented (Unger 1999). Employers' decisions and actions are underpinned by the fundamental question of whether the associated costs, i.e., the cost of the time spent reading and implementing the IEST™, outweigh the benefits (Hernandez and McDonald 2010; Scott et al. 2017). In order to address this valid concern, further research is required to explore effective pathways for engaging this time-poor, productivity driven population if they are to effectively hire and support employees on the autism spectrum.

Recommendations for improvement to the IEST™

Several insightful recommendations are proposed in relation to refining the IEST™ for prospective employers hiring and supporting individuals on the autism spectrum. Findings from this study highlight that employers are time-poor, requiring the current extensive format of the IEST™ to be more practical, accessible and easily

readable in the context of a busy work environment. To improve the usability of the IEST™, it is recommended that it be developed into an online web-based application accessible on a range of electronic devices. An online version and the function of a search bar would increase employers' efficiency and speed in accessing the information most relevant to their situation. Alternatively, a shorter, revised pocket edition of the IEST™ combined with single page summary sheets detailing the most essential daily information is recommended. For employers at different stages of the employment process (recruitment versus providing ongoing support), with varying levels of experience supporting employees on the autism spectrum, the development of both beginner and advanced versions of the IEST™ are recommended, tailored to the complexities and needs encountered by employers. Lastly, the addition of a module addressing autism and mental health in the workplace may assist employers in identifying the potential triggers of 'meltdowns' and information relating to the signs of anxiety, stress and depression, and provide them with information on appropriate support strategies.

Limitations

The majority of participants who responded to the call to engage in a follow-up interview were from Western Australia. Until the National Disability Strategy is comprehensively implemented across Australia (Council of Australian Governments 2011), the services, systems and policies supporting individuals with a disability are governed at state and territory level. The lack of equal representation across states and territories may present a biased view of participant's experiences supporting and employing people on the autism spectrum. While the effectiveness of the IEST™ was established in improving employers' self-efficacy and knowledge in modifying the work environment for employees on the autism spectrum, the effectiveness of the

IEST™ motivated modifications were not considered from the perspective of the employees themselves. An understanding of experiences of employees on the autism spectrum would have provided additional valuable insight into the IEST™ and its impact on employee job satisfaction, work performance and successful integration and inclusion in the workplace.

Conclusion

Overall, the IEST™ was recommended as useful tool, with even LR reporting its effects and benefits in their work environments. The process evaluation highlighted the effectiveness of the IEST™ in improving employers' knowledge and confidence in supporting employees on the autism spectrum, confirming the RCT findings. More importantly it provided an in-depth understanding as to *why* the IEST™ was effective, which aspects of this tool facilitated or prevented its implementation and how it may be further optimised for prospective employers.

References

- American Psychiatric Association (2000). *Diagnostic and statistical manual of mental disorders (4th ed, text rev.)*. Washington, DC: American Psychiatric Association.
- American Psychiatric Association (2013). *Diagnostic and statistical manual of mental disorders (5th ed, text rev.)*. Arlington, VA: American Psychiatric Publishing.
- Australian Bureau of Statistics (2015). *Disability, ageing and carers, Australia: Summary of Findings*. Canberra: ABS.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. [Article]. *Psychological Review*, *84*(2), 191-215, doi:10.1037/0033-295X.84.2.191.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. [Article]. *Qualitative Research in Psychology*, *3*(2), 77-101, doi:10.1191/1478088706qp063oa.
- Chen, J. L., Leader, G., Sung, C., & Leahy, M. (2015a). Trends in Employment for Individuals with Autism Spectrum Disorder: a Review of the Research Literature. [journal article]. *Review Journal of Autism and Developmental Disorders*, *2*(2), 115-127, doi:10.1007/s40489-014-0041-6.
- Chen, J. L., Sung, C., & Pi, S. (2015b). Vocational Rehabilitation Service Patterns and Outcomes for Individuals with Autism of Different Ages. [journal article]. *Journal of Autism and Developmental Disorders*, *45*(9), 3015-3029, doi:10.1007/s10803-015-2465-y.
- Choque Olsson, N., Rautio, D., Asztalos, J., Stoetzer, U., & Bölte, S. (2016). Social skills group training in high-functioning autism: A qualitative responder study. [Article]. *Autism*, *20*(8), 995-1010, doi:10.1177/1362361315621885.
- Council of Australian Governments (2011). *National Disability Strategy 2010-2020: An initiative of the Council of Australian Governments*. (pp. 1-76). Canberra: ACT.
- Department of Industry Innovation and Science (2016). *Australian Industry Report 2016*. (pp. 1-170). Canberra, ACT: Office of the Chief Economist, Department of Industry, Innovation and Science.
- DePoy, E. G., & Gitlin, L. N. (2005). *Introduction to research: understanding and applying multiple strategies* (3rd ed.). St. Louis: Elsevier Mosby.
- Erickson, W. A., von Schrader, S., Bruyère, S. M., & VanLooy, S. A. (2014). The Employment Environment: Employer Perspectives, Policies, and Practices Regarding the Employment of Persons With Disabilities. *Rehabilitation Counseling Bulletin*, *57*(4), 195-208, doi:10.1177/0034355213509841.
- Evans, R., Scourfield, J., & Murphy, S. (2015). Pragmatic, formative process evaluations of complex interventions and why we need more of them. *Journal of Epidemiology and Community Health*, *69*(10), 925, doi:<http://dx.doi.org/10.1136/jech-2014-204806>.
- Fusch, P. I., & Ness, L. R. (2015). Are we there yet? Data saturation in qualitative research. [Article]. *Qualitative Report*, *20*(9), 1408-1416.
- Gates, L. B. (1993). The role of the supervisor in successful adjustment to work with a disabling condition: Issues for disability policy and practice. [Article]. *Journal of Occupational Rehabilitation*, *3*(4), 179-190, doi:10.1007/BF01097428.
- Gates, L. B., Akabas, S., & Kantrowitz, W. (1996). Supervisors' role in successful job maintenance: A target for rehabilitation counselor efforts. *Journal of Applied Rehabilitation Counseling*, *27*(3), 60-66.
- Gilbride, D., Stensrud, R., Vandergoot, D., & Golden, K. (2003). Identification of the characteristics of work environments and employers open to hiring and accommodating people with disabilities. *Rehabilitation Counseling Bulletin*, *46*(3), 130-190.

- Hagner, D., & Cooney, B. (2003). Building employer capacity to support employees with severe disabilities in the workplace. *Work, 21*(1), 77-82.
- Hagner, D., & Cooney, B. (2005). "I do that for everybody": Supervising employees with autism. *Focus on Autism and Other Developmental Disabilities, 20*(2), 91-97, doi:10.1177/10883576050200020501.
- Hartnett, H. P., Stuart, H., Thurman, H., Loy, B., & Batiste, L. C. (2011). Employers' perceptions of the benefits of workplace accommodations: reasons to hire, retain and promote people with disabilities. *Journal of Vocational Rehabilitation, 34*(1), 17-23.
- Hendricks, D. (2010). Employment and adults with autism spectrum disorders: Challenges and strategies for success. *Journal of Vocational Rehabilitation, 32*(2), 125-134.
- Hernandez, B., & McDonald, K. (2010). Exploring the Costs and Benefits of Workers with Disabilities. *Journal of Rehabilitation, 76*(3), 15-23.
- Hillier, A., Campbell, H., Mastriani, K., Izzo, M. V., Kool-Tucker, A. K., Cherry, L., et al. (2007). Two-Year Evaluation of a Vocational Support Program for Adults on the Autism Spectrum. *Career Development for Exceptional Individuals, 30*(1), 125-134.
- Howlin, P., Alcock, J., & Burkin, C. (2005). An 8 year follow-up of a specialist supported employment service for high-ability adults with autism or Asperger syndrome. *Autism, 9*, 533-549, doi:10.1177/1362361305057871.
- Howlin, P., Arciuli, J., Begeer, S., Brock, J., Clarke, K., Costley, D., et al. (2015). Research on adults with autism spectrum disorder: Roundtable report. *Journal of Intellectual & Developmental Disability, 40*(4), 388-393, doi:10.3109/13668250.2015.1064343.
- Kaye, H., Jans, L., & Jones, E. (2011). Why Don't Employers Hire and Retain Workers with Disabilities? *Journal of Occupational Rehabilitation, 21*(4), 526-536, doi:10.1007/s10926-011-9302-8.
- Lattimore, L., Parsons, M., & Reid, D. (2006). Enhancing job-site training of supported workers with autism: A reemphasis on simulation. *Journal of Applied Behavior Analysis, 39*(1), 91-102.
- Lawer, L., Brusilovskiy, E., Salzer, M. S., & Mandell, D. S. (2009). Use of vocational rehabilitative services among adults with autism. *J Autism Dev Disord, 39*(3), 487-494, doi:10.1007/s10803-008-0649-4.
- Leonard, H., Dixon, G., Whitehouse, A. J. O., Bourke, J., Aiberti, K., Nassar, N., et al. (2010). Unpacking the complex nature of the autism epidemic. *Research in Autism Spectrum Disorders, 4*(4), 548-554, doi:<http://dx.doi.org/10.1016/j.rasd.2010.01.003>.
- Lorenz, T., Frischling, C., Cuadros, R., & Heintz, K. (2016). Autism and Overcoming Job Barriers: Comparing Job-Related Barriers and Possible Solutions in and outside of Autism-Specific Employment. *Plos One, 11*(1), e0147040, doi:10.1371/journal.pone.0147040.
- Mank, D., Cioffi, A., & Yovanoff, P. (1997). Analysis of the typicalness of supported employment jobs, natural supports, and wage and integration outcomes. [Article]. *Mental Retardation, 35*(3), 185-197.
- Mautz, D., Storey, K., & Certo, N., J. (2001). Increasing integrated workplace social interactions: The effects of job modification, natural supports, adaptive communication instruction, and job coach training. *Journal of the American Society of Hypertension, 26*(4), 257-269.
- Medical Research Council (2008). Developing and evaluating complex interventions: new guidance. (pp. 1-39).
- Migliore, A., Butterworth, J., & Zalewska, A. (2014). Trends in Vocational Rehabilitation Services and Outcomes of Youth With Autism: 2006–2010. *Rehabilitation Counseling Bulletin, 57*(2), 80-89, doi:10.1177/0034355213493930.

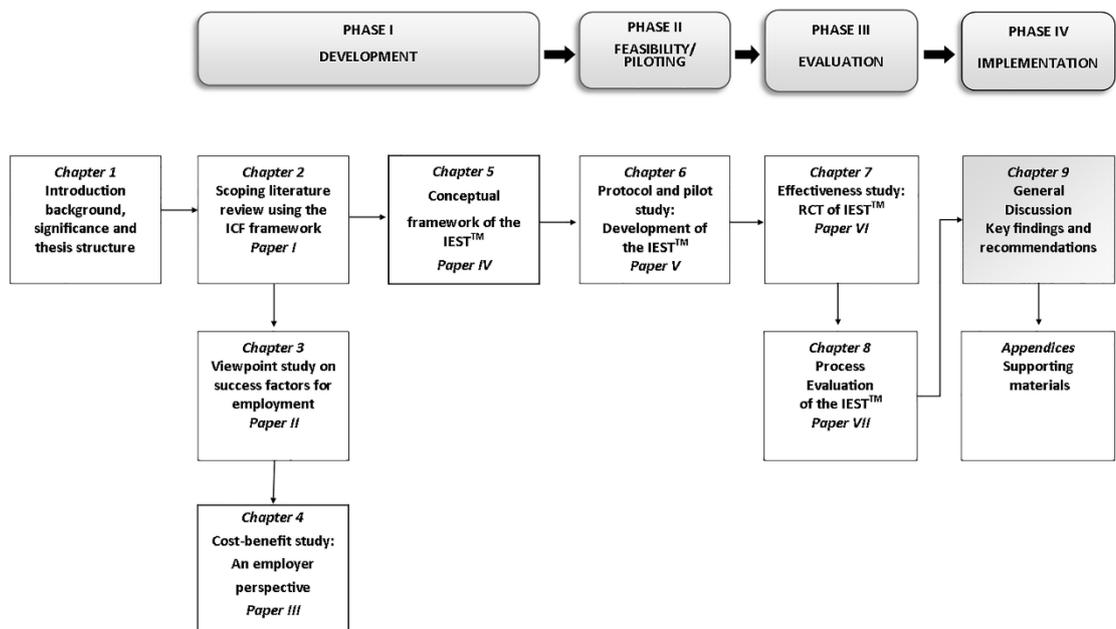
- Moore, G. F., Audrey, S., Barker, M., Bond, L., Bonell, C., Hardeman, W., et al. (2015). Process evaluation of complex interventions: Medical Research Council guidance. [10.1136/bmj.h1258]. *BMJ : British Medical Journal*, 350, doi:<http://dx.doi.org/10.1136/bmj.h1258>.
- Morgan, R. L., & Alexander, M. (2005). The employer's perception: employment of individuals with developmental disabilities. *Journal of Vocational Rehabilitation*, 23(1), 39-49.
- Müller, E., Schuler, A., Burton, B. A., & Yates, G. B. (2003). Meeting the vocational support needs of individuals with Asperger syndrome and other autism spectrum disabilities. *Journal of Vocational Rehabilitation*, 18, 163-175.
- Nicholas, D., Attridge, M., Zwaigenbaum, L., & Clarke, M. (2014). Vocational support approaches in autism spectrum disorder: A synthesis review of the literature. *Autism*, doi:10.1177/1362361313516548.
- NVivo (2015). NVivo qualitative data analysis software. (11 ed.): QSR International Pty Ltd.
- Oakley, A., Strange, V., Bonell, C., Allen, E., & Stephenson, J. (2006). Process evaluation in randomised controlled trials of complex interventions. *British Medical Journal*, 332, 413-416, doi:<http://dx.doi.org/10.1136/bmj.332.7538.413>.
- Portney, L. G., & Watkins, M. P. (2009). *Foundations of Clinical Research: Applications to Practice* (3rd ed.). Upper Saddle River, New Jersey: Pearson: Prentice Hall.
- Rashid, M., Hodgetts, S., & Nicholas, D. (2017). Building Employers' Capacity to Support Vocational Opportunities for Adults with Developmental Disabilities. [Article]. *Review Journal of Autism and Developmental Disorders*, 4(2), 165-173, doi:10.1007/s40489-017-0105-5.
- Richards, J. (2012). Examining the exclusion of employees with Asperger syndrome from the workplace. [Article]. *Personnel Review*, 41(5), 630-646, doi:10.1108/00483481211249148.
- Rogan, P., Banks, B., & Howard, M. (2000). Workplace supports in practice: As little as possible, as much as necessary. *Focus on Autism and Other Developmental Disabilities*, 15(1), 2.
- Scott, M., Falkmer, M., Girdler, S., & Falkmer, T. (2015). Viewpoints on Factors for Successful Employment for Adults with Autism Spectrum Disorder. *Plos One*, 10(10), e0139281, doi:10.1371/journal.pone.0139281.
- Scott, M., Jacob, A., Hendrie, D., Parsons, R., Girdler, S., Falkmer, T., et al. (2017). Employers' perception of the costs and the benefits of hiring individuals with autism spectrum disorder in open employment in Australia. *Plos One*, 12(5), 1-16, doi:e0177607. <https://doi.org/10.1371/journal.pone.0177607>.
- Scott., M., Falkmer, M., Falkmer, T., & Girdler, S. (2018). Evaluating the effectiveness of an autism-specific workplace tool for employers: A randomised controlled trial. *Journal of Autism and Developmental Disorders*, 1-16, doi:10.1007/s10803-018-3611-0.
- Taylor, M. C. (2007). *Evidence-based practice for occupational therapists*. (2nd ed.). Oxford: Blackwell Publishing Ltd.
- Tourangeau, R., & Yan, T. (2007). Sensitive Questions in Surveys. [Article]. *Psychological Bulletin*, 133(5), 859-883, doi:10.1037/0033-2909.133.5.859.
- Unger, D. (1999). Workplace supports: A view from employers who have hired supported employees. [Article]. *Focus on Autism and Other Developmental Disabilities*, 14(3), 167-179, doi:10.1177/108835769901400306.
- Unger, D. (2002). Employers' Attitudes Toward Persons with Disabilities in the Workforce: Myths or Realities? *Focus on Autism and Other Developmental Disabilities*, 17(1), 2-10, doi:10.1177/108835760201700101.
- Unger, D. (2007). Addressing employer personnel needs and improving employment training, job placement and retention for individuals with disabilities through public-private partnerships. *Journal of Vocational Rehabilitation*, 26(1), 39-48.

- Unger, D., & Kregel, J. (2003). Employers' knowledge and utilization of accommodations. *Work, 21*(1), 5-15.
- Vogeley, K., Kirchner, J. C., Gawronski, A., Tebartz van Elst, L., & Dziobek, I. (2013). Toward the development of a supported employment program for individuals with high-functioning autism in Germany. *European Archives of Psychiatry and Clinical Neuroscience, 263*, 197-203, doi:10.1007/s00406-013-0455-7.
- World Health Organization (2001). *International Classification of Functioning, Disability and Health*. Geneva: WHO.

Chapter 9: General Discussion

Preface

Chapter 9 provides a synthesis and summary of findings, describing the implications of the results, critically reviewing the strengths and limitations of the thesis and suggesting recommendations made for future research. This chapter highlights the impact of environmental factors on the employment of individuals on the autism spectrum.



Overview

The central aim of this thesis was to design, develop and evaluate the effectiveness of an autism-specific workplace tool for employers. The four phases, as described by the MRC framework, guided the development and evaluation of the complex intervention, the IEST™ (1). In phase I, a multifaceted needs assessment was conducted, underlying the proceeding phases. Specifically, phase I involved: a scoping review examining the extent and range of literature relating to the employment of individuals on the autism spectrum. The viewpoint study identified key factors for successful employment from both the viewpoints of adults on the autism spectrum and their employers, contrasting the similarities and differences in their views. Next, the benefits and costs of employing adults on the autism spectrum were examined from the perspective of the employer. Lastly, a conceptual framework that underpinned the subsequent IEST™ intervention was identified. Phase II focused on the development and piloting of the IEST™. In piloting the intervention, the aim was to test the feasibility and accessibility of the IEST™ and provide formative and process feedback in preparation for the RCT. Phase III conducted a RCT to determine the effectiveness of the IEST™ in improving employers' self-efficacy and knowledge in modifying the work environment to meet the specific needs of their employees on the autism spectrum, in comparison to usual workplace support for employers. Following the completion of the RCT, a process evaluation was conducted to provide an in-depth understanding if the IEST™ was effective, exploring feedback regarding IEST™ facilitators and barriers and potential recommendations for improvement. Lastly, in completing this thesis, phase IV addresses the implications, dissemination and recommendations made for future research.

Key findings and implications

The ICF is based on a biopsychosocial perspective of health, recognising the dynamic interaction of the physical, psychological and social factors, in this thesis, influencing work participation for individuals on the autism spectrum (2). This chapter uses the ICF framework to structure the key findings and implications of this thesis.

A biopsychosocial perspective

The medical model views autism as the problem of the individual, requiring them to take responsibility for their disability and make the necessary personal and behavioural adjustments to be eligible for employment (3). Although this approach to autism is not obvious in current employment interventions, the scoping review conducted (Chapter 2) revealed that while the 32 intervention-based studies had the stated collective purpose of improving employment outcomes, they were primarily impairment-focused, targeting their interventions at modifying intrinsic, individual autistic characteristics. Interventions focused on autism-related traits were commonly associated with difficulties in finding and securing a job, such as social communication interaction and executive functioning. While the specific targeted difficulties by the interventions varied, they commonly included promoting themselves in an interview, work-related social interactions, navigating workplace social norms, problem solving and task management (4-8). While many of these interventions were effective in improving the vocational and executive functioning skills required to enhance the employment status of individuals on the autism spectrum, many participants continued to remain unemployed. The continued high rates of unemployment for this group suggest that impairment-focused interventions alone are not sufficient in addressing the barriers to successful employment, highlighting the need to consider environmental factors.

Environmental factors are integral in understanding the interaction between individuals on the autism spectrum and the work context in which they are employed (9). Interestingly, the scoping review (Chapter 2) revealed that many studies incorporated environmental factors in their interventions, including employer and co-worker support, the use of job coaches and technology (10-13). However, these factors were merely used as a means of delivering or implementing the interventions targeting autistic characteristics. Not one study focused on environmental factors as the primary target of intervention. This is concerning, given that participation in the workforce for individuals on the autism spectrum can either be facilitated or hindered by the impact of the physical, social and attitudinal environments in which their lives are lived (2). The continued medicalisation and individualisation of autism-related traits have resulted in the development of adult-based interventions that are impairment-focused in nature, leading to policies, systems and practices targeting individuals, rather than social

organisations and the environment (9). Consequently, the understanding of autism and functioning remains heavily entrenched in the medical model perspective of health, with little consideration given to the social component.

The scoping review (Chapter 2) highlighted the need for a societal shift in perspective in considering disability as biopsychosocial construct that is influenced by the environment in which individuals on the autism spectrum may participate such as, the workplace (14). Using the ICF as a framework, a variety of environmental factors were identified as either facilitating or hindering successful employment for individuals on the autism spectrum, such as employers and co-workers, workplace attitudes, inclusive and diverse management practices, implementation of workplace accommodations and external support from disability employment service (DES) providers (15-18). Employers were identified as the most influential factor, with the capacity for hiring and supporting prospective employees in their workplace (19). Given the critical role that employers play in the employment process and the need for autism-specific interventions and services addressing contextual factors, a series of studies were undertaken to understand and address employers' employment support needs.

Understanding employers' needs

Employers have increasingly demonstrated their capacity to hire and support employees with a disability, exhibiting a willingness to implement accommodations and adjust their management practices to be more flexible (20, 21). The unique needs of the autism population differ considerably in comparison to other disabilities, requiring employers to have an understanding of the condition and particular skills to effectively support these individuals (22, 23). However, employers are often under supported and overlooked as a key resource in the employment process, with DES providers representing and focusing on the employment support needs of employees on the autism spectrum, leaving little time available to support employers. If employers are to be successful in providing effective supports to individuals on the autism spectrum, it is crucial that an understanding of their needs and concerns in the hiring and retaining process are acknowledged and addressed accordingly (24). The viewpoint study (Chapter 3) aimed to identify factors needed for successful employment from the perspective of employers, while also contrasting them against the employment success factors identified by employees on the autism spectrum (25). Three major areas of concern related to employment were identified, including: i) the need for external support in identifying appropriate workplace

accommodations, job or tasks adjustments and behaviour management strategies; ii) a lack of knowledge and experience in supporting employees on the autism spectrum; and, iii) concern regarding the ability of employees on the autism spectrum in meeting the company's productivity demands and standards. These results indicated that while many employers were committed to the employment of individuals on the autism spectrum, they also identified systemic barriers to hiring and retaining them. The viewpoint study highlighted the need for employment services and supports to target employers' skills, abilities and knowledge in effectively modifying and managing the work environment to improve employment outcomes for individuals on the autism spectrum.

The impact of employer attitudes

While employer concerns are valid, many are underpinned by their attitudes towards autism in the workplace, which may positively or negatively impact their hiring decisions. Attitudes are multidimensional and conceptualised as behavioural, cognitive and affective components that have been shaped by a variety of influences (26, 27). While in general employers hold positive attitudes towards individuals on the autism spectrum, a continuous gap remains between their willingness to hire and actual employment rates (28, 29). This may be the result of negative employer attitudes that are often underpinned by misconceptions or a lack of knowledge regarding autism, such as concerns with work-related skills, reduced profits from poorer productivity and incurring additional costs associated with workplace accommodations, supervision and training (30-32). Employers are concerned with the costs outweighing the benefits, and until this attitudinal concern is addressed, potential employers may continue to remain conflicted and reluctant to employ individuals on the autism spectrum (33). The cost-benefit study (Chapter 4), investigated the associated costs and benefits of employing an adult on the autism spectrum in comparison to a matched employee without autism (34). The results of the study suggested that employers do not incur additional costs when employing an adult on the autism spectrum over and above that associated with any new employee. In addition, this study revealed that employees on the autism spectrum demonstrated above standard workplace performance when compared to their counterparts with regard to increased attention to detail, work ethic and quality of work. Employers also identified widespread organisational benefits of employing an adult on the autism spectrum including influencing the workplace culture with the addition of new and creative skills, an increase in autism awareness and a conscious positive shift towards inclusion. While these findings are critical in challenging

employer attitudes, this study also highlighted the need to consider the impact of employer characteristics on hiring and supporting adults on the autism spectrum. As demonstrated in this study, favourable employer attitudes were associated with larger organisations (250+ employees) and previous experience working with employees with a disability. These results align with previous research (35-38), suggesting that understanding specific employer characteristics may be useful in indicating prospective employers open to hiring and supporting individuals on the autism spectrum.

The effectiveness of an employer-based intervention

Given the potential capacity of employers to implement workplace modifications, influence workplace culture, diversify the workforce and enforce organisational policies and practices that remove barriers to work participation (15, 19), a comprehensive understanding of the role of employers and the difficulties they encounter in the employment process was required. Although many studies have suggested autism awareness training as a strategy in improving employers' capacity to hire and support individuals by increasing their understanding of autism (11, 20, 39, 40), there is little high-quality evidence to support its effectiveness and long-term influence. In order to address employment barriers related to employers' confidence in modifying the work environment to meet the specific needs of their employees on the autism spectrum, the IEST™ workplace tool was developed, as described in Chapter 6. The IEST™ was developed as an education-based intervention, with the goal of improving employers' self-efficacy in implementing workplace modifications and their attitudes towards autism through increased knowledge. The results of the RCT study (Chapter 7) demonstrated not only the effectiveness of the IEST™ in significantly improving employers' self-efficacy in modifying the work environment in comparison to usual workplace supports, but also that methodologically rigorous research is possible within complex, dynamic work environments. Findings from the RCT suggested that implementing an education-based intervention that increased knowledge, may increase self-efficacy (41). While there were no significant attitudinal improvements among employers who used the IEST™, baseline characteristics suggested that they already had favourable attitudes towards autism, with almost half of all participants having previously worked with an individual with a disability and more than one third of employers working with large organisations, as previously discussed in Chapter 4. The findings of the RCT study are timely given the paucity of evidence examining the effectiveness of employer-based

interventions (42, 43), and the need for interventions, such as the IEST™ in improving employment outcomes.

Empowering employers through increased knowledge

In response to the need to address the limitations of current approaches to the disability employment support of individuals on the autism spectrum, the IEST™ was specifically developed targeting employers. While the RCT study (Chapter 7) was useful in evaluating the effectiveness of the intervention, it was focused on exploring prespecified outcomes and not on the process involved implementing the IEST™ (44). The process evaluation (Chapter 8) revealed employers' experiences using the IEST™, their perceptions of its usability, recommendations for improvements and the perceived barriers and enablers to the implementation of an autism-specific workplace tool. Overall, employers described the IEST™ as a useful and informative tool, most effective in increasing autism awareness and understanding of how the work environment itself could act as a barrier to employees on the autism spectrum. Findings in this study revealed that the IEST™ provided clarity in relation to autism-related traits and associated behaviours. It was evident that the more employers knew about autism, the more confident they felt in approaching their employees to discuss their needs. Employer confidence is considered a key factor in identifying and implementing appropriate and effective workplace modifications (21). While the IEST™ was mostly considered useful by participants, many indicated that the tool would be most beneficial to employers with no previous autism-related experience and those without the support of a DES provider. This finding is not surprising considering that inexperienced employers are often reluctant to hire individuals on the autism spectrum, feeling unprepared and lacking autism-specific knowledge to support their workplace needs (38, 45).

Significance of implications

It is well recognised that individuals on the autism spectrum may confront many barriers in the process of finding and securing a job (46-48). A previously noted barrier to employment is employers' lack of knowledge regarding autism and attitudes towards hiring and supporting these individuals in the workplace (39, 49). This thesis has investigated and addressed these attitudinal and knowledge-related barriers of employers through the development of an evidence-based tool, the IEST™, and examined the cost-benefit argument. To the PhD candidate's knowledge this thesis presents the world's first autism-specific evidence-based tool

targeting employers, assisting in the modifying of the work environment. The evaluation of the IEST™ via a RCT addressed the need for more high-quality evidence of the effectiveness of adult interventions (50). The IEST™ was effective in increasing employers' self-efficacy and knowledge in modifying the work environment for individuals on the autism spectrum. The more knowledge employers had regarding autism, the more confident they were in supporting their employee's needs through implementing appropriate workplace accommodations. Given these findings, the IEST™ has the potential to be implemented Australia-wide in organisations as a practical, educational resource for employers, co-workers and human resource departments. The IEST™ is multipurpose and may be used as a tool for increasing autism awareness in the workplace, identifying the specific needs of the employee and providing workplace modification strategies. Making the IEST™ available to businesses and organisations regardless of whether they are currently employing someone on the autism spectrum or not, may be of benefit to prospective employers considering employing an individual on the autism spectrum. Providing employers with the opportunity to access the IEST™ in their workplace may increase their autism-specific knowledge prior to engaging in the process of hiring an individual on the autism spectrum. It is important to note that the IEST™ is not an alternative replacement to DES providers, instead it has the potential to be utilised alongside the support of DES providers as a complimentary resource to employers.

In addressing the previously stated attitudes and concerns of employers regarding the unknown additional costs of providing workplace accommodations, supervision and training of employees on the autism spectrum (32), the IEST™ was developed with the intention of being cost-effective, straightforward and time efficient. Many of the strategies included in the IEST™ promote workplace modifications likely to be beneficial to both employees with and without autism. This thesis assists in ameliorating the perceived costs, and instead highlights that given the right supports, many of which are cost-effective and included within the IEST™, employees on the autism spectrum can be successfully employed in a variety of competitive work environments (10). Focusing on this cost-benefit argument will provide employers the opportunity to diversify their workplace. Diversity is beneficial to organisational success offering a competitive edge in creativity and innovation, increased morale and productivity and enhancing relationships with the autism community (51-53). The cost-benefit argument in this thesis advocates that employing individuals on the autism spectrum is a good business decision,

not only at an individual and organisational level, but at a societal level. These findings indicate that employing people who would normally not be considered for employment now presents them with the opportunity to contribute to society, while simultaneously reducing government costs and reliance on funding allocated to unemployment (54). The findings of this study have the potential to mitigate employers' concerns and perceptions, through providing them with the IEST™, a reliable, evidence-based resource to support them through the employment process. The more employers and organisations who have access to the IEST™, the more likely employment opportunities are to improve for individuals on the autism spectrum.

Limitations

This section of the thesis reflects on aspects of the research process that could be improved upon if it were to be repeated, along with considerations for future research undertakings. These limitations provide an overview of the methodological issues for consideration in relation to research design, ASD diagnosis, sample and outcome measures.

Research design

The IEST™ was designed to be implemented in employers' workplaces Australia-wide, under real workplace conditions. While the advantage of this approach encourages the fidelity of the intervention, it also poses a social threat to internal validity (55, 56). The complexity of the intervention was increased through multiple worksites in which the IEST™ was implemented and the variance in employers' previous experience working with employees with disabilities, workplace cultures and climates, and organisational policies and practices (57). This complexity made it difficult to control the confounding factors that may have occurred in everyday work environments. While strategies were implemented to enhance the fidelity of the IEST™, such as random assignment to either the intervention or control group, blinding of participants to group allocation and detailed instructions in relation to the implementation of the IEST™ (55, 57), one of the greatest challenges experienced in this study was controlling for compliance in the intervention. Although the IEST™ was designed to be implemented according to the individual needs of employees on the autism spectrum and not by a specific dosage, more than two thirds of the intervention group only used the IEST™ once, monthly or not at all. Despite regular contact with participants during the study, the issue of compliance continued and may have been attributed to: i) the time-poor nature of the employer population; and ii) the possible lack

of urgency on employers' part in assigning time to voluntarily participate in an activity with no monetary compensation. These factors may have influenced the extent to which the IEST™ was implemented in the work environment (58).

The format of the IEST™ was also considered a limitation. Employers were presented with the opportunity to choose between a paper-based or interactive PDF version of the IEST™, comprised of eight modules containing autism-specific information, checklists and goal setting activities, workplace modification strategies and additional work-related resources. Given the complexities already associated with conducting a trial Australia-wide under real workplace conditions, the requirement of using a paper-based or interactive PDF version was impractical and an unrealistic expectation that some employers would have found it difficult to have the time to read through a comprehensive guide to gain the necessary autism-related support strategies. Employers benefit from resources that are informative and practical, which can also immediately be accessed and implemented (21). The development of the IEST™ in the format of an online web-based application would have increased the usability and accessibility of the intervention across a range of electronic devices (59). An online version categorising the relevant information associated with each phase of the employment process and the function of a search tool would have increased employers' efficiency and speed in accessing the information most pertinent to their situation (60). In addition, an online version of the IEST™ would have assisted in accurately monitoring participants' usage of the web-based application, rather than relying on self-report measures, which often are unreliable and inaccurate in assessing adherence (61).

ASD diagnosis

While the focus of this thesis was in understanding the employment of individuals on the autism spectrum, it was from the perspective of the employer and their capacity in modifying the work environment accordingly. With the exception of the viewpoint study (Chapter 3), this thesis did not conduct research directly with individuals on the autism spectrum. While the remaining studies in this thesis involved working directly with employers, the inclusion criteria necessitated a reliance on employees declaring to their employers that they had been diagnosed with ASD (4), with no direct means of verifying the accuracy of these self-reports. Consequently, diagnosis was considered valid as self-report (61). Given that the IEST™ was

developed for employers' assisting them in identifying and implementing workplace modifications according to the more commonly associated characteristics and needs of employees on the autism spectrum, the reliance on self-report may, however, be justified. Self-report, or disability disclosure in the context of employment is necessary when an employee requires workplace modifications and flexible working arrangements.

Sample

Due to the complex nature of this research, the process of identifying and recruiting employers with no previous autism-related experience and those without the support of DES provider was particularly difficult due to the legalities regarding disability disclosure in the workplace. In Australia, under the Disability Discrimination Act 1992, if an employee discloses a disability in the workplace, employers are required by law to keep all information about the disability confidential (62). Written consent from the employee with a disability is required should any information relating to their disclosure be necessary. This restricted the recruitment process of contacting employers directly, necessitating a reliance on DES providers sharing employer contact details (with both the employee and employer's consent), many of which were already employing individuals on the autism spectrum, and may therefore not have been the suited population to the IEST™ intervention. This recruitment limitation highlights the need to find a suitable pathway for identifying employers with little to no previous autism-related experience.

Approximately 700 employers Australia-wide were contacted to participate in research examining the employment of individuals on the autism spectrum, with a final total of 178 employers choosing to participate in the viewpoint study ($n=35$; Chapter 3), cost-benefit study ($n=59$; Chapter 4) and RCT study ($n=84$; Chapter 7). The relatively small size of employers may not be completely representative of the broader Australian population of employers hiring and supporting individuals on the autism spectrum (55). Of the 178 employers, more than half were from Western Australia. This may primarily be attributed to the PhD candidate living in Western Australia, with a greater capacity to network and engage with the employer community. The lack of equal representation across states and territories may present a biased view of participants' experiences in supporting and employing individuals on the autism spectrum, particularly as services, systems and policies supporting individuals with disability in Australia are governed at state and territory level.

Another potential bias is that participants in the study could have been those with the most positive experiences or personal connections to an individual on the autism spectrum, making them more likely to participate. The possible altruistic nature of participants may have skewed the overall results of this study, given that employers with positive attitudes towards disability are more likely to recognise the perceived benefits of employing an individual on the autism spectrum and demonstrate a willingness to implement workplace accommodations (16, 30, 49). Another explanation could be that more than 60% of participants were supported by a DES provider, through which many participants were also recruited. Due to the nature of their supportive relationship and financial assistance provided they may have felt obliged to participate. Taken together, these limitations may reduce the generalisability of the results (56).

Outcome measures

An absence of autism-specific employment outcome measures with established psychometric properties necessitated both the development and adaptation of employer-related measures. This was anticipated given the findings from the scoping review (Chapter 2), whereby employment measures were predominantly characterised as descriptive, observational and non-standardised, with several studies developing their own outcome tools. The few standardised employment-related measures identified were tailored to assess the vocational or work-related skills, job performance and supports required for individuals on the autism spectrum (63-67), with not a single standardised measure targeting the employer. Consequently, only internal consistency and face and content validity were established for outcome measures created and adapted in this study (55). The development of the Employer Self-Efficacy Scale (ESES) used in the RCT (Chapter 7) was necessary, as no available measure with established reliability and validity existed addressing the constructs relating to employer self-efficacy in supporting employees on the autism spectrum. This is not a standardised measure, with the results derived by this measure needing to be interpreted with caution. Although a Cronbach alpha coefficient of 0.97 was established, along with the construct validity of the scale through expert review within the research team and externally through a community reference group, further consideration is required in relation to validity, reliability and the sensitivity and specificity of the self-efficacy constructs (68). Given the multifaceted constructs of self-efficacy in relation to employers working in dynamic and diverse work environment (69), the establishment of more advanced psychometric properties was

considered beyond the scope of this thesis. This limitation may however have impacted on applicability and consistency of the results.

Recommendations

The thesis presents extensive knowledge in relation to the central role employers play in influencing work participation for individuals on the autism spectrum and the effective implementation of an autism-specific workplace tool. The evidence presented in this thesis can be utilised to improve employment outcomes for individuals on the autism spectrum by translating these findings into practice. The following chapter outlines recommendations for the IEST™, employers and future research.

Recommendations for the IEST™

A crucial component in understanding employers as environmental factors influencing the employment process is acknowledging and addressing their needs and concerns (24). One of the most important concerns highlighted in this thesis was employers' need for knowledge and understanding of autism. To address this issue, the IEST™ may be more beneficial to prospective employers with no previous autism-related experiences and those without the support from a DES provider. Inexperienced employers are often hesitant to hire individuals on the autism spectrum, feeling they lack autism-specific knowledge and are unprepared and uncertain of how to accommodate and support their unique workplace needs (21, 45). If employment rates for individuals on the autism spectrum are to increase, then employers need to be effectively equipped to provide appropriate support (35). Prospective employers who have access to the IEST™ prior to engaging in the process of hiring someone on the autism spectrum will be provided the opportunity to dispel misconceptions, improve their autism-specific knowledge and increase their awareness of the associated benefits and strengths of individuals on the autism spectrum.

Workplaces that foster a culture of inclusion and promote diversity create opportunities for growth, innovation and increase productivity, frequently providing organisations with a competitive edge (70, 71). Employer practices play a key role in creating a culture and climate of inclusion through modifying the recruitment processes, implementing workplace accommodations and engaging in flexible work arrangements (15). The use of the IEST™ by

both prospective and current employers may assist them in developing internal support structures to develop inclusive workplace practices and in identifying aspects of their organisations which can be improved upon to enhance diversity.

Many employers value and rely on external support provided by a DES provider to assist in the hiring and retaining of employees on the autism spectrum (72, 73). In Australia, DES providers are considered experts in connecting people with a disability to prospective employers. DES providers play a key role in assisting people with a disability in finding and securing a job through job matching, assisting in the job application process, providing support during an interview and adjusting the workplace according to the individual's needs (74). Their role also requires working with employers, providing guidance on disability awareness and legislation, available financial support and flexible work arrangements (74, 75). Many employers depend on external support for guidance and reassurance when first interacting with their new employee on the autism spectrum, in managing unpredictable workplace issues that may arise with an employee and as a liaison for non-work related issues affecting the job, such as personal hygiene (20). However, many DES providers reduce their support overtime as the employer and employee progress in the work relationship, and as result of limited available funding (76). To assist employers during the interim of regular DES provider on-site visits and as DES support progressively declines overtime, it is recommended that the IEST™ may be a helpful resource to employers providing strategies and workplace modifications during the interim. The IEST™ has not be designed to replace the role of DES providers, but rather to work in combination to support employers' needs.

From an external support perspective, many DES providers are generalists, often lacking an in-depth understanding of workplace needs specific to individuals on the autism spectrum, relying instead on generic disability support, knowledge and strategies (50, 77). As a result, the employment support needs of both employees on the autism spectrum and their employers may be overlooked and under supported, particularly in relation to the social support needs in the workplace (78). It is recommended that DES providers may benefit from the use of the IEST™ in increasing their understanding of the unique support needs related to autism, identifying the subsequent specific support needs of employers and in providing tailored

support strategies and workplace modifications to be implemented. The availability of the IEST™ to DES providers will not only improve their knowledge, skills and abilities in supporting employees on the autism spectrum, but it may also be a resource that they may provide to employers as part of their ongoing support, ultimately increasing employers' accessibility to the tool.

In order to successfully address the needs of both current and prospective employers, further development and re-evaluation of the IEST™ is required. The use of an online web-based application will increase the accessibility of the IEST™, as many organisations and workplaces have access to and utilise the internet as a resource, across multiple devices during business hours (60). A web-based application may also increase employers' efficiency and speed when accessing their required relevant information, particularly through the use of online modules and a search tool. Next, the IEST™ was demonstrated as useful and well-suited to many work environments, regardless of employers' previous experience or stage of the employment process (recruitment versus providing ongoing support). To ensure the IEST™ meets the needs of a diverse group of employers requiring varying levels of support, the development of beginner, intermediate and advanced versions of the tool is recommended. The different versions of the IEST™ should be tailored to complexities and needs encountered by employers including behavioural management strategies, managing mental health in the workplace and potential triggers, workplace bullying, performance evaluations and career advancement. Another recommendation may be to develop a training package version of the IEST™, with the goal of increasing awareness of autism within the workplace for all co-workers and providing social communication interaction strategies (39, 79). An IEST™ training package could be designed to easily be implemented by human resource departments, employers or supervisors within the workplace, proving to be time-efficient and cost-effective. In addition, a training package addressing autism in the workplace aligns with many businesses and organisations' workplace diversity and social inclusion policies and practices within Australia (71).

Recommendations for employers

Although not directly supported by the data in the current thesis, several recommendations could be hypothesised for employers. The process of undertaking and engaging in disability awareness training and education is considered an important strategy in increasing people's understanding of disability in the workplace (76). This was supported by the viewpoint study

(Chapter 3), whereby both employees on the autism spectrum and employers agreed that autism awareness training for all staff in the workplace was essential. Autism awareness training is an important strategy in improving employment opportunities (40), providing employers and staff with purposeful and specific information and reinforcing the strengths and abilities of employees on the autism spectrum (18).

As indicated by the findings in the cost-benefit study (Chapter 4), despite employers being eligible for financial assistance when employing an individual on the autism spectrum, many employers did not access this resource. This may in part be due to a lack of knowledge regarding the current available wages subsidy schemes and financial incentives. Employers' misperceptions regarding the additional costs of employing individuals on the autism spectrum may be ameliorated should they have an increased awareness and easy access to financial support, with the potential benefits derived improving employment opportunities and job retention (80, 81). Wage subsidy information and eligibility should be included in organisational policies and practices, often managed by HR departments (82), who are primarily responsible for the recruitment of prospective employees.

Traditional recruitment practices and procedures in relation to job advertising, interviewing and job descriptions are likely barriers to employment for many individuals on the autism spectrum (33, 78). Many recruitment approaches are not considered diversity friendly, and are designed with the intention of evaluating prospective employees' social communication skills, which for many individuals on the autism spectrum is challenging (83). One such recommendation to remove recruitment barriers is for employers to conduct workplace trials and internships, whereby individuals on the autism spectrum are provided the opportunity to demonstrate their work-related skills under less pressured circumstances, and employers can better determine the suitability of the job-match. Workplace trials and internships may also support attitudinal changes given that employer attitudes appear to positively change with increased exposure or experience in supporting individuals on the autism spectrum (38, 84).

Recommendations for future research

This thesis has continuously highlighted the significant role that employers play in the hiring and supporting of individuals on the autism spectrum. However, employers are a difficult population to engage in the research process, often citing time constraints and a reluctance to share sensitive organisational information as barriers to participation. If employers are to become key facilitators in the process of improving employment outcomes, then new approaches to recruitment practices are essential in actively engaging them. One such recommendation could be the use of well-recognised champions, such as Specialisterne, SAP and Microsoft, global companies that have previously demonstrated success and the benefits of employing individuals on the autism spectrum (85). Following more effective approaches to engaging employers in the research process, there is need for more high-quality research in exploring of the impact of extrinsic, social and environmental factors on employment outcomes, with the subsequent development and evaluation of associated interventions (86, 87).

The findings of the scoping review (Chapter 2), as well as the limitations addressed in this chapter have revealed a significant lack of reliable and valid measures assessing employment intervention outcomes for both adults on the autism spectrum and employers (50). In order to address this issue, there is a need to explore and define what constitutes as a successful employment outcome for adults on the autism spectrum (88). This is particularly important as the perspectives of adults on the autism spectrum were outside the scope of this thesis. In doing so, an individualised approach is encouraged, providing an opportunity for individuals on the autism spectrum to express what is important to them about having a job. While the heterogeneity associated with autism will make the process of defining employment success challenging, there will most likely be consensus in relation to the broader definitions of certain outcomes including employment status, work participation, job satisfaction, financial gain and career growth and development. The process of exploring and defining employment success will assist in the development of future employment outcome measures and interventions, specifically in identifying and directing areas in need of research and support. To close the gap between knowledge and practice in research, the involvement of adults on the autism spectrum is crucial, incorporating their knowledge, perspectives, experiences and ideas in the

development of such measures and subsequent interventions (89). Such a collaboration will ensure that future measures and interventions target the needs as identified and prioritised by the autism community (90).

Knowledge translation

Knowledge translation is the process of translating knowledge into action. However, a consistent lack of translation of findings into practice and policy has been identified within clinical and health services related research (91, 92). Consequently, the gaps between evidence and practice is wide, limiting access to optimal resources and supports for both employers and employees on the autism spectrum (93). This contributes to lost productivity at both the individual and societal level, leading to poor employment outcomes for individuals on the autism spectrum and an increased reliance on government funding (94, 95). This thesis provides evidence that may play a critical role in facilitating employment outcomes for individuals on the autism spectrum through increasing employers' confidence and knowledge in modifying the work environment. Throughout the process of conducting this study, the PhD candidate undertook activities aimed at translating research findings into practice. These activities included: i) presentation of findings at scientific and non-scientific conferences; ii) presentation of findings to representatives from DES providers, prospective and current employers, clinicians, families, adults on the autism spectrum and community members; iii) participation in local and national radio and online interviews; and iv) the publication of three scientific articles and submission of five scientific manuscripts.

This thesis was guided by a community reference group comprising of adults on the autism spectrum, parents of individuals on the autism spectrum, teachers with experiences in transition planning, disability employment coordinators, clinicians and expert researchers. Consultation with a community reference group is an expected component of health research, leading to greater quality and clinical relevance due to the unique experiences and perspectives each individual can bring to the research (96). The community reference group assisted in validating findings and played an essential role in the design and development of the IEST™ (97). Consultation with the community reference group ensured connection to the community

and increased the likelihood of the research being useful and relevant in relation to employers supporting individuals on the autism spectrum.

Summary

In summary, employment occurs within complex, dynamic environments (98). The ICF was a useful framework in understanding the influence of environmental factors contributing to the employment of individuals on the autism spectrum (99). Employers were recognised as key facilitators in modifying the work environment according to the unique needs of their employees on the autism spectrum. The implementation of the IEST™, a world first evidence-based autism-specific workplace tool, has important implications for both prospective and current employers. The IEST™ was evaluated as effective in improving employers' confidence and knowledge in hiring and supporting individuals on the autism spectrum. The findings are timely given the paucity of evidence examining the effectiveness of employer-based interventions (43), and the dramatic increase in the number of adolescents on the autism spectrum transitioning from high school to adulthood as they begin seeking employment (100, 101). The employment of individuals on the autism spectrum is an issue that *cannot* be ignored. The consequences of poor employment outcomes occur not only at the individual level, with lower socioeconomic status and poor quality of life (94, 102), but at an organisational level through lost productivity and ingenuity, and at a societal level through an increased reliance on government funding (54). The findings of this thesis address this issue using the cost-benefit argument that advocates that employing individuals on the autism spectrum is a '*good business decision*'. In the words of politician Thomas Perez,

"Employers have recognised for some time it's smart business to have a diverse workforce-one in which many views are represented, and everyone's talents are valued.

Well, disability is part of diversity."

References

1. Medical Research Council. Developing and evaluating complex interventions: new guidance. 2008.
2. World Health Organization. International Classification of Functioning, Disability and Health: Child and Youth version. Geneva: WHO; 2007.
3. Dempsey I, & Nankervis, K. Conception of disability. In: Dempsey I, & Nankervis, K., editor. Community Disability Services: An evidence-based approach to practice. Sydney, Australia: UNSW Press; 2006. p. 3-26.
4. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (5th ed, text rev.). Arlington, VA: American Psychiatric Publishing; 2013.
5. Bonete S, Calero, M.D., & Fernandez-Parra, A. Group training in interpersonal problem-solving skills for workplace adaptation of adolescents and adults with Asperger syndrome: a preliminary study. *Autism*. 2015;19(4):409-20.
6. Smith MJ, Ginger EJ, Wright K, Wright MA, Taylor JL, Humm LB, et al. Virtual Reality Job Interview Training in Adults with Autism Spectrum Disorder. *Journal of Autism and Developmental Disorders*. 2014;44(10):2450-63.
7. Liu KP, Wong D, Chung AC, Kwok N, Lam MK, Yuen CM, et al. Effectiveness of a workplace training programme in improving social, communication and emotional skills for adults with autism and intellectual disability in Hong Kong--a pilot study. *Occupational Therapy International*. 2013;20(4):198-204.
8. Kellems RO, & Morningstar, M.E. Using video modeling delivered through ipods to teach vocational tasks to young adults with autism spectrum disorders. *Career Development and Transition for Exceptional Individuals*. 2012;35(3):155-67.
9. Schneidert M, Hurst, R., Miller, J., & Ustun, Berdirhan. The role of Environment in the International Classification of Functioning, Disability and Health (ICF). *Disability and Rehabilitation*. 2003;25(11-12):588-95.
10. Mawhood L, & Howlin, P. The Outcome of a Supported Employment Scheme for High-Functioning Adults with Autism or Asperger Syndrome. *Autism*. 1999;3(3):229-54.
11. Hillier A, Campbell, H., Mastriani, K., Izzo, M. V., Kool-Tucker, A.K., Cherry, L et al. Two-Year Evaluation of a Vocational Support Program for Adults on the Autism Spectrum. *Career Development for Exceptional Individuals*. 2007;30(1):125-34.
12. Burke RV, Allen, K.D., Howard, M.R., Downey, D., Matz, M. G., & Bowen, S.L. Tablet-based video modeling and prompting in the workplace for individuals with autism. *Journal of Vocational Rehabilitation*. 2013;38(1):1-14.
13. Hill DA, Belcher, L., Brigman, H.E., Renner, S., & Stephens, B. The Apple iPad™ as an Innovative Employment Support for Young Adults with Autism Spectrum Disorder and Other Developmental Disabilities. *Journal of Applied Rehabilitation Counseling*. 2013;44(1):28-37.
14. Shakespeare T. The social model of disability. In: J. LD, editor. *The Disability Studies Reader*. 4 ed. Hoboken: Hoboken : Taylor and Francis; 2013. p. 197-204.
15. Erickson WA, von Schrader, S., Bruyère, S,M., & VanLooy, S,A. The Employment Environment: Employer Perspectives, Policies, and Practices Regarding the Employment of Persons With Disabilities. *Rehabilitation Counseling Bulletin*. 2014;57(4):195-208.
16. Ju S, Roberts, E., & Zhang, D. Employer attitudes toward workers with disabilities: A review of research in the past decade. *Journal of Vocational Rehabilitation*. 2013;38(2):113-23.
17. Lawer L, Brusilovskiy, E., & Salzer, M. S., Mandell DS. Use of vocational rehabilitative services among adults with autism. *J Autism Dev Disord*. 2009;39(3):487-94.
18. Unger DD. Workplace supports: A view from employers who have hired supported employees. *Focus on Autism and Other Developmental Disabilities*. 1999;14(3):167-79.

19. Gates LB. The role of the supervisor in successful adjustment to work with a disabling condition: Issues for disability policy and practice. *Journal of Occupational Rehabilitation*. 1993;3(4):179-90.
20. Hagner D, & Cooney, B. F. "I do that for everybody': Supervising employees with autism. *Focus on Autism and Other Developmental Disabilities*. 2005;20(2):91-7.
21. Unger D, & Kregel, J. Employers' knowledge and utilization of accommodations. *Work*. 2003;21(1):5-15.
22. Lopez B, & Keenan, L. Barriers to employment in autism: Future challenges to implementing the Adult Autism Strategy. *Autism Research Network*; 2014.
23. Nesbitt S. Why and why not? Factors influencing employment for individuals with Asperger syndrome. *Autism*. 2000;4(4):357-69.
24. Chan F, Strausser, D., Maher, P., Lee, E.J., Jones, R., & Johson, T. Demand-side factors related to the employment of people with disabilities: A survey of employes in the Midwest region of the United States. *Journal of Occupational Rehabilitation*. 2010;20:412-9.
25. Scott M, Falkmer, M., Girdler, S., & Falkmer, T. Viewpoints on Factors for Successful Employment for Adults with Autism Spectrum Disorder. *PLoS One*. 2015;10(10):e0139281.
26. Augoustinos M, & Walker, I. *Social cognition: An integrated introduction*. London: UK: SAGE Publications Ltd; 1995.
27. Berry JO, & Meyer, J.A. Employing people with disabilities: Impact of attitude and situation. *Rehabilitation Psychology*. 1995;40(3):211-22.
28. Copeland J. The impact of disability in the workplace: An assessment of employer attitudes toward people with disabilities and the Americans with Disabilities Act. unpublished: Capella University; 2007.
29. Hernandez B, Keys C, Balcazar F. Employer attitudes toward workers with disabilities and their ADA employment rights: A literature review. *Journal of Rehabilitation*. 2000;66(4):4-16.
30. Hartnett HP, Stuart, H., Thurman, H., Loy, B., & Batiste, L. C. Employers' perceptions of the benefits of workplace accommodations: reasons to hire, retain and promote people with disabilities. *Journal of Vocational Rehabilitation*. 2011;34(1):17-23.
31. Cimera RE, & Cowan, R. J. The costs of services and employment outcomes achieved by adults with autism in the US. *Autism*. 2009;13(3):285-302.
32. Hernandez B, & McDonald, K. Exploring the Costs and Benefits of Workers with Disabilities. *Journal of Rehabilitation*. 2010;76(3):15-23.
33. Fraser R, Ajzen, I., Johnson, K., Hebert, J., & Chan, F. Understanding employers' hiring intention in relation to qualified workers with disabilities. *Journal of Vocational Rehabilitation*. 2011;35(1):1-11.
34. Scott M, Jacob, A., Hendrie, D., Parsons, R., Girdler, S., Falkmer, T., & Falkmer, M. . Employers' perception of the costs and the benefits of hiring individuals with autism spectrum disorder in open employment in Australia. *Plos One*. 2017;12(5):1-16.
35. Gilbride D, Stensrud, R., Vandergoot, D., & Golden, K. Identification of the characteristics of work environments and employers open to hiring and accommodating people with disabilities. *Rehabilitation Counseling Bulletin*. 2003;46(3):130-90.
36. Bricout JC, & Bentley, K. J. Disability status and perceptions of employability by employers. *Social Work Research*. 2000;24(2):87-95.
37. Houtenville A, & Kalargyrou, V. People with disabilities: Employers' perspectives on recruitment practices, strategies, and challenges in leisure and hospitality. *Cornell Hospitality Quarterly*. 2012;53(1):40-52.
38. Morgan RL, & Alexander, M. The employer's perception: employment of individuals with developmental disabilities. *Journal of Vocational Rehabilitation*. 2005;23(1):39-49.
39. Müller E, Schuler, A., Burton, B. A., & Yates, G. B. Meeting the vocational support needs of individuals with Asperger syndrome and other autism spectrum disabilities. *Journal of Vocational Rehabilitation*. 2003;18:163-75.

40. Howlin P, Alcock, J., & Burkin, C. An 8 year follow-up of a specialist supported employment service for high-ability adults with autism or Asperger syndrome. *Autism*. 2005;9:533-49.
41. Bandura A. Perceived self-efficacy in cognitive development and functioning. *Educational Psychologist*. 1993;28(2):117-48.
42. Chen JL, Leader, G., Sung, C., & Leahy, M. Trends in Employment for Individuals with Autism Spectrum Disorder: a Review of the Research Literature. *Review Journal of Autism and Developmental Disorders*. 2015;2(2):115-27.
43. Nicholas D, Attridge, M., Zwaigenbaum, L., & Clarke, M. Vocational support approaches in autism spectrum disorder: A synthesis review of the literature. *Autism*. 2014.
44. Oakley A, Strange, V., Bonell, C., Allen, E., & Stephenson, J. Process evaluation in randomised controlled trials of complex interventions. *British Medical Journal*. 2006;332:413-6.
45. Hagner D, & Cooney, B. Building employer capacity to support employees with severe disabilities in the workplace. *Work*. 2003;21(1):77-82.
46. Hendricks D. Employment and adults with autism spectrum disorders: Challenges and strategies for success. *Journal of Vocational Rehabilitation*. 2010;32(2):125-34.
47. Hurlbutt K, & Chalmers, L. Employment and Adults with Asperger Syndrome. *Focus on Autism and Other Developmental Disabilities*. 2004;19(4):215-22.
48. Lorenz T, Frischling C, Cuadros R, Heinitz K. Autism and Overcoming Job Barriers: Comparing Job-Related Barriers and Possible Solutions in and outside of Autism-Specific Employment. *PLoS ONE*. 2016;11(1):e0147040.
49. Unger DD. Employers' Attitudes Toward Persons with Disabilities in the Workforce: Myths or Realities? *Focus on Autism and Other Developmental Disabilities*. 2002;17(1):2-10.
50. Howlin P, Arciuli J, Begeer S, Brock J, Clarke K, Costley D, et al. Research on adults with autism spectrum disorder: Roundtable report. *Journal of Intellectual & Developmental Disability*. 2015;40(4):388-93.
51. Mor Barak ME. The inclusive workplace: an ecosystems approach to diversity management. *Social Work*. 2000;45(4):339-53.
52. Wehman P. Workplace inclusion: persons with disabilities and coworkers working together. *Journal of Vocational Rehabilitation*. 2003;18(2):131-41.
53. Gwele NS. Diversity management in the workplace: beyond compliance. *Curatoris*. 2009;32(2):4-10.
54. Jacob A, Scott, M., Falkmer, M., & Falkmer, T. The Costs and Benefits of Employing an Adult with Autism Spectrum Disorder: A Systematic Review. *PLoS ONE*. 2015;10(10):e0139896.
55. Portney LG, & Watkins, M. P. *Foundations of Clinical Research: Applications to Practice*. 3rd ed. Upper Saddle River: New Jersey: Pearson: Prentice Hall; 2009.
56. Supino PG. Fundamental issues in evaluating the impact of interventions: Sources and control of bias. In: Supino PG, & Borer, J.S., editor. *Constructing and evaluating self-report measures*, in *Principles of research methodology: A guide for clinical investigators*. New York: Springer; 2012. p. 79-110.
57. Horner S, Rew, L., & Torres, R. Enhancing intervention fidelity: A means of strengthening study impact. *Journal for Specialists in Pediatric Nursing*. 2006;11(2):80-9.
58. Breitenstein SM, Gross, D., Garvey, C. A., Hill, C., Fogg, L., & Resnick, B. Implementation fidelity in community-based interventions. *Research in Nursing and Health*. 2010;33(2):164-73.
59. Wantland DJ, Portillo, C. J., Holzemer, W. L., Slaughter, R., & McGhee, E. M. The effectiveness of web-based vs. non-web-based interventions: A meta-analysis of behavioral change outcomes. *Journal of Medical Internet Research*. 2004;6(4).
60. Ryan C, Bergin, M., Chalder, T., & Wells, J.S.G. Web-based interventions for the management of stress in the workplace. *Journal of Occupational Health*. 2017;59(3):215.

61. Flom PL, Supino, P.G. & Philip Ross, N. Constructing and evaluating self-report measures. In: Supino PG, & Borer, J.S., editor. Principles of research methodology: A guide for clinical investigators. New York: Springer; 2012. p. 147-75.
62. Disability Discrimination Act, (1992).
63. Taylor JL, & Seltzer, M. M. Developing a vocational index for adults with autism spectrum disorders. *J Autism Dev Disord*. 2012;42(12):2669-79.
64. Gal E, Meir AB, Katz N. Development and Reliability of the Autism Work Skills Questionnaire (AWSQ). *The American Journal of Occupational Therapy*. 2013;67(1):e1-5.
65. Katz N, Dejak, I., & Gal, E. Work performance evaluation and QoL of adults with High Functioning Autism Spectrum Disorders (HFASD). *Work*. 2015;51(4):887-92.
66. Gentry T, Kriner, R., Sima, A., McDonough, J., & Wehman, P. Reducing the Need for Personal Supports Among Workers with Autism Using an iPod Touch as an Assistive Technology: Delayed Randomized Control Trial. *Journal of Autism & Developmental Disorders*. 2015;45(3):669-84.
67. Wehman P, Schall CM, McDonough J, Graham C, Brooke V, Riehle JE, et al. Effects of an employer-based intervention on employment outcomes for youth with significant support needs due to autism. *Autism*. 2016:1-15.
68. Price LR. *Psychometric Methods : Theory into Practice*: New York : Guilford Publications; 2017.
69. Bandura A. *Social foundations of thought and action: A social cognitive theory*. Engelwood Cliffs, NJ: Prentice-Hall; 1986.
70. Ailey SH, Brown P, Friese T, Dugan S. Building a culture of inclusion: Disability as opportunity for organizational growth and improving patient care. *Journal of Nursing Administration*. 2016;46(1):9-11.
71. Australian Department of Human Services. *Workplace diversity and inclusion strategy 2016-2019*. Australian Government: Department of Human Services; 2016.
72. Petty DM, & Fussell, E. M. Employer Attitudes and Satisfaction with Supported Employment. *Focus on Autism and Other Developmental Disabilities*. 1997;12(1):15-22.
73. Gilbride D, Stensrud, R., Ehlers, C., Evans, E., & Peterson, C. Employers' attitudes toward hiring persons with disabilities and vocational rehabilitation services. *Journal of Rehabilitation*. 2000;66(4):17-23.
74. Department of Social Services. *JobAccess: Driving disability employment 2017* [Available from: <https://www.jobaccess.gov.au/>].
75. Ellenkamp J, Brouwers, E., Embregts, P., Joosen, M., & Weeghel, J. Work Environment-Related Factors in Obtaining and Maintaining Work in a Competitive Employment Setting for Employees with Intellectual Disabilities: A Systematic Review. *Journal of Occupational Rehabilitation*. 2016;26(1):56-69.
76. Rashid M, Hodgetts S, Nicholas D. Building Employers' Capacity to Support Vocational Opportunities for Adults with Developmental Disabilities. *Review Journal of Autism and Developmental Disorders*. 2017;4(2):165-73.
77. Lattimore L, Parsons, M., & Reid, D. Enhancing job-site training of supported workers with autism: A reemphasis on simulation. *Journal of Applied Behavior Analysis*. 2006;39(1):91-102.
78. Richards J. Examining the exclusion of employees with Asperger syndrome from the workplace. *Personnel Review*. 2012;41(5):630-46.
79. Vogeley K, Kirchner, J. C., Gawronski, A., Tebartz van Elst, L., & Dziobek, I. Toward the development of a supported employment program for individuals with high-functioning autism in Germany. *European Archives of Psychiatry and Clinical Neuroscience*. 2013;263:197-203.
80. Borland J. *Wage Subsidy Programs: A Primer 1*. *Australian Journal of Labour Economics*. 2016;19(3):131-44.

81. Jasper CR, Waldhart P. Employer attitudes on hiring employees with disabilities in the leisure and hospitality industry: Practical and theoretical implications. *International Journal of Contemporary Hospitality Management*. 2013;25(4):577-94.
82. Green JH, Brooke V. Recruiting and retaining the best from America's largest untapped talent pool. *Journal of Vocational Rehabilitation*. 2001;16(2):83-8.
83. Strickland DC, Coles CD, Southern LB. JobTIPS: A transition to employment program for individuals with autism spectrum disorders. *J Autism Dev Disord*. 2013;43(10):2472-83.
84. Gilbride D, Stensrud R, Vandergoot D, Golden K. Identification of the characteristics of work environments and employers open to hiring and accommodating people with disabilities. *Rehabilitation Counseling Bulletin*. 2003;46(3):130-7.
85. Austin R, Wareham, J., & Busquets, J. *Specialisterne: Sense & Details*. Harvard Business School. 2008.
86. Holwerda A, van der Klink, J. J., Groothoff, J. W., & Brouwer, S. Predictors for work participation in individuals with an Autism spectrum disorder: a systematic review. *J Occup Rehabil*. 2012;22(3):333-52.
87. Kirby AV, Baranek, G. T., & Fox, L. Longitudinal predictors of outcomes for adults with autism spectrum disorder: Systematic review. *OTJR Occupation, Participation and Health*. 2016;36(2):55-64.
88. Taylor JL. When is a good outcome actually good? *Autism*. 2017;1-2.
89. Pellicano L, Dinsmore, A., & Charman, T. . *A future made together: Shaping autism research in the UK*. London: Institute of Education; 2013.
90. Cooperative Research Centre for Living with Autism. *Inclusive research practice guides and checklists for autism research: Version 2*. Brisbane, Queensland: Autism CRC Ltd; 2016.
91. Graham ID, Logan J, Harrison MB, Straus SE, Tetroe J, Caswell W, et al. Lost in knowledge translation: time for a map? *The Journal of continuing education in the health professions*. 2006;26(1):13-24.
92. Kastner M, & Straus, S.E. Application of the Knowledge-to-Action and Medical Research Council frameworks in the development of an osteoporosis clinical decision support tool. *Journal of Clinical Epidemiology*. 2012;65(11):1163-70.
93. Grimshaw JM, Eccles, M. P., Lavis, J. N., Hill, S. J., & Squires, J. E. Knowledge translation of research findings. *Implementation Science*. 2012;7(1).
94. Gerhardt F, & Lainer, I. Addressing the Needs of Adolescents and Adults with Autism: A Crisis on the Horizon. *Journal of Contemporary Psychotherapy*. 2011;41(1):37-45.
95. Järbrink K, McCrone P, Fombonne E, Zandén H, Knapp M. Cost-impact of young adults with high-functioning autistic spectrum disorder. *Research in Developmental Disabilities*. 2007;28(1):94-104.
96. Boote J, Telford, R., & Cooper, C. Consumer involvement in health research: A review and research agenda. *Health Policy*. 2002;61(2):213-36.
97. Entwistle VA, Renfrew, M. J., Yearley, S., Forrester, J., & Lamont, T. Lay perspectives: Advantages for health research. *British Medical Journal*. 1998;316(7129):463-6.
98. Shattuck PT, & Roux, A.M. Commentary on employment supports research. *Autism: The International Journal of Research & Practice*. 2015;19(2):246-7.
99. World Health Organization. *International Classification of Functioning, Disability and Health*. Geneva: WHO; 2001.
100. Shattuck PT, Narendorf, S. C., Cooper, B., Sterzing, P. R., Wagner, M., & Taylor, J. L. Postsecondary education and employment among youth with an autism spectrum disorder. *Pediatrics*. 2012;129(6):1042-9.
101. Wei X, Wagner, M., Hudson, L., Yu, J. W., & Shattuck, P. Transition to Adulthood: Employment, Education, and Disengagement in Individuals With Autism Spectrum Disorders. *Emerging Adulthood*. 2015;3(1):37-45.

102. Fleming AR, Fairweather JS, Leahy MJ. Quality of Life As a Potential Rehabilitation Service Outcome: The Relationship Between Employment, Quality of Life, and Other Life Areas. *Rehabilitation Counseling Bulletin*. 2013;57(1):9-22.

Thesis References

Every reasonable effort has been made to acknowledge the owners of copyright material. I would be pleased to hear from any copyright owner who has been omitted or incorrectly acknowledged.

Thesis Reference List

- Adolfsson M, Simmeborn Fleischer, A. Applying the ICF to identify requirements for students with Asperger syndrome in higher education. *Dev Neurorehabil.* 2013.
- Ailey SH, Brown P, Friese T, Dugan S. Building a culture of inclusion: Disability as opportunity for organizational growth and improving patient care. *Journal of Nursing Administration.* 2016;46(1):9-11.
- Allen KD, Wallace DP, Greene DJ, Bowen SL, Burke RV. Community-based vocational instruction using videotaped modeling for young adults with autism spectrum disorders performing in air-inflated mascots. *Focus on Autism and Other Developmental Disabilities.* 2010; 25:186-92.
- Allen KD, Wallace DP, Renes D, Bowen SL, Burke RV. Use of video modeling to teach vocational skills to adolescents and young adults with autism spectrum disorders. *Education and Treatment of Children.* 2010;33(3):339-49.
- American Psychiatric Association. *Diagnostic and statistical manual of mental disorders* (4th ed, text rev.). Washington, DC: Author; 2000.
- American Psychiatric Association. *Diagnostic and statistical manual of mental disorders* (5th ed, text rev.). Arlington, VA: American Psychiatric Publishing; 2013.
- Anderson A, Moore, D. W., Rausa, V. C., Finkelstein, S., Pearl, S., & Stevenson, M. A Systematic Review of Interventions for Adults with Autism Spectrum Disorder to Promote Employment. *Review Journal of Autism and Developmental Disorders.* 2017;4(1):26-38.
- Arikawa M, Goto H, Mineno K. Job support by occupational therapists for people with developmental disabilities: Two case studies. *Work.* 2013;45(2):245-51.
- Arksey H, & O'Malley, L. Scoping Studies: Towards a Methodological Framework. *International Journal of Social Research Methodology.* 2005;8(1):19-32.
- Armstrong T. *Neurodiversity: Discovering the extraordinary gifts of autism, ADHD, dyslexia, and other brain differences.* . Cambridge: Da Capo; 2010.
- Augoustinos M, & Walker, I. *Social cognition: An integrated introduction.* London: UK: SAGE Publications Ltd; 1995.
- Austin R, Wareham, J., & Busquets, J. *Specialisterne: Sense & Details.* Harvard Business School. 2008.
- Australian Bureau of Statistics. *Autism in Australia, 2009.* Canberra, ACT; 2009.
- Australian Bureau of Statistics. *Survey of disability, ageing and carers; cat. no. 4430.0.* Canberra, ACT: Australian Government; 2010.
- Australian Bureau of Statistics. *Autism in Australia.* Canberra: ACT: Australian Bureau of Statistics; 2012. Contract No.: CAT. 4428.0.
- Australian Bureau of Statistics. *Disability, Ageing and Carers, Australia: Summary of Findings, 2012.* Canberra: Australian Bureau of Statistics; 2013. Contract No.: Cat. No. 4430.0.
- Australian Bureau of Statistics. *Autism in Australia 2012* Canberra: ABS; 2014. Contract No.: Cat. no. 4428.0.
- Australian Bureau of Statistics. *Disability, ageing and carers, Australia: Summary of Findings.* Canberra: ABS; 2015. Contract No.: 4430.0.
- Australian Centre for Corporate Social Responsibility. *The 10th year-Progress and prospects for CSR in Australia and New Zealand: The state of CSR in Australia and New*

- Zealand annual review 2014. Docklands, Victoria: Australian Centre for Corporate Social Responsibility; 2014.
- Australian Department of Human Services. National Disability Insurance Scheme 2010 [Available from: <https://www.ndis.gov.au/index.html>].
- Australian Department of Human Services. Workplace diversity and inclusion strategy 2016-2019. Australian Government: Department of Human Services; 2016.
- Australian Government. National Statement on Ethical Conduct in Human Research. Canberra, ACT: Australian Government; 2007.
- Autism Europe. Autism and work: together we can. Brussels, Belgium: Autism Europe; 2014.
- Baldwin S, Costley, D., & Warren, A. Employment Activities and Experiences of Adults with High-Functioning Autism and Asperger's Disorder. *Journal of Autism and Developmental Disorders*. 2014;44(10):2440-9.
- Bandura A. Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*. 1977;84(2):191-215.
- Bandura A, & Adams, N. E. Analysis of self-efficacy theory of behavioral change. *Cognitive Therapy and Research*. 1977;1(4):287-310.
- Bandura A, Adams, N. E., & Beyer, J. Cognitive processes mediating behavioral change. *Journal of Personality and Social Psychology*. 1977;35(3):125-39.
- Bandura A. Self-efficacy mechanism in human agency. *American Psychologist*. 1982;37(2):122-47.
- Bandura A. Social foundations of thought and action: A social cognitive theory. Englewood Cliffs, NJ: Prentice-Hall; 1986.
- Bandura A. Perceived self-efficacy in cognitive development and functioning. *Educational Psychologist*. 1993;28(2):117-48.
- Bandura A. Self-efficacy. In: Ramachandran VC, editor. *Encyclopedia of human behavior*. 4. New York. NY: Academic Press; 1994. p. 71-81.
- Bandura A. Self-efficacy in changing societies. New York: Cambridge University Press; 1995.
- Bandura A. Self-efficacy : the exercise of control / Albert Bandura. New York: W.H. Freeman & Co.; 1997.
- Bandura A. Exercise of personal agency through the self-efficacy mechanism. In: Schwarzer R, editor. *Self-efficacy: Thought control of action*. New York: Routledge; 2014. p. 3-38.
- Bartholomew LK, Parcel, G. S., Kok, G., Gottlieb, N.H., & Fernandez, M.E. Planning health promotion programs: an intervention mapping approach. San Francisco: Wiley; 2011.
- Baxter AJ, Brugha, T. S., Erskine, H. E., Scheurer, R. W. ,Vos, T., & Scott, J. G. The epidemiology and global burden of autism spectrum disorders. *Psychological Medicine*. 2015;45(3):601-13.
- Bennett K, Brady MP, Scott J, Dukes C, Frain M. The effects of covert audio coaching on the job performance of supported employees. *Focus on Autism & Other Developmental Disabilities*. 2010;25(3):173-85.
- Berry JO, & Meyer, J.A. Employing people with disabilities: Impact of attitude and situation. *Rehabilitation Psychology*. 1995;40(3):211-22.
- Billstedt E, & Gillberg, C. Autism after adolescence: population-based 13- to 22-year follow-up study of 120 individuals with autism diagnosed in childhood. *Journal of Autism & Developmental Disorders*. 2005;35(3):351-60.
- Bishop-Fitzpatrick L, Minshew N, Eack S. A Systematic Review of Psychosocial Interventions for Adults with Autism Spectrum Disorders. *Journal of Autism & Developmental Disorders*. 2013;43(3):687-94.
- Blackman, I, & Chiveralls, K. Factors Influencing Workplace Supervisor Readiness to Engage in Workplace-Based Vocational Rehabilitation. *Journal of Occupational Rehabilitation*. 2011;21(4):537-46.

- Bölte S, Mahdi, S., de Vries, P.J., Granlund, M., Robison, J., Shulman, C., Swedo, S., Tonge, B., Wong, V., Zwaigenbaum, L., Segerer, W., & Selb, M. The Gestalt of Functioning in Autism Spectrum Disorder: Results of the International Conference to Develop Final Consensus ICF Core Sets. 2017.
- Bölte S, De Schipper E, Robison JE, Wong VCN, Selb M, Singhal N, et al. Classification of functioning and impairment: The development of ICF core sets for autism spectrum disorder. *Autism Research*. 2014;7(1):167-72.
- Bonete S, Calero, M.D., & Fernandez-Parra, A. Group training in interpersonal problem-solving skills for workplace adaptation of adolescents and adults with Asperger syndrome: a preliminary study. *Autism*. 2015;19(4):409-20.
- Boote J, Telford, R., & Cooper, C. Consumer involvement in health research: A review and research agenda. *Health Policy*. 2002;61(2):213-36.
- Borland J. Wage Subsidy Programs: A Primer 1. *Australian Journal of Labour Economics*. 2016;19(3):131-44.
- Braun V, Clarke V. Using thematic analysis in psychology. *Qualitative Research in Psychology*. 2006;3(2):77-101.
- Breitenstein SM, Gross, D., Garvey, C. A., Hill, C., Fogg, L., & Resnick, B. Implementation fidelity in community-based interventions. *Research in Nursing and Health*. 2010;33(2):164-73.
- Bricout JC, & Bentley, K. J. Disability status and perceptions of employability by employers. *Social Work Research*. 2000;24(2):87-95.
- Briel LW, & Getzel, E.E. In their own words: The career planning experiences of college students with ASD. *Journal of Vocational Rehabilitation*. 2014;40(3):195-202.
- Brown S. *Political Subjectivity: Application of Q Methodology in Political Science*. New Have, CT: Yale University Press; 1980.
- Burckhardt CS. Educating patients: Self-management approaches. *Disability and Rehabilitation*. 2005;27(12):703-9.
- Bureau of Labor Statistics. *America's Young Adults at 25: School enrollment, number of jobs held and labor market activity: results of a longitudinal survey*. Washington DC: US: Department of Labor; 2013.
- Burgess S, & Cimera, R.E. Employment Outcomes of Transition-Aged Adults With Autism Spectrum Disorders: A State of the States Report. *American Journal on Intellectual and Developmental Disabilities*. 2014;119(1):64-83.
- Burke J, Bezyak J, Fraser RT, Pete J, Ditchman N, Chan F. Employers' Attitudes Towards Hiring and Retaining People with Disabilities: A Review of the Literature. *The Australian Journal of Rehabilitation Counselling*. 2013;19(1):21-38.
- Burke RV, Andersen, M. N., Bowen, S. L., Howard, M. R., & Allen, K. D. Evaluation of two instruction methods to increase employment options for young adults with autism spectrum disorders. *Research in Developmental Disabilities*. 2010;31(6):1223-33.
- Burke RV, Allen, K.D., Howard, M.R., Downey, D., Matz, M. G., & Bowen, S.L. Tablet-based video modeling and prompting in the workplace for individuals with autism. *Journal of Vocational Rehabilitation*. 2013;38(1):1-14.
- Burt DB, Fuller, S.P., & Lewis, K. R. Brief report: Competitive employment of adults with autism. *Journal of Autism and Developmental Disorders*. 1991;21(2):237-42.
- Campbell A, & Tincani, M. The Power Card Strategy: Strength-Based Intervention to Increase Direction Following of Children With Autism Spectrum Disorder. *Journal of Positive Behavior Interventions*. 2011;13(4):240-9.
- Campbell MD, Fitzpatrick R, Haines A, Kinmonth A, Sandercock P, Spiegelhalter D, et al. Framework for design and evaluation of complex interventions to improve health. *BMJ*. 2000;321:694-6.

- Campbell NC, Murray E, Darbyshire J, Emery J, Farmer A, Griffiths F, et al. Designing and evaluating complex interventions to improve health care. *BMJ*. 2007;334(7591):455.
- Capo LC. Autism, employment, and the role of occupational therapy. *Work*. 2001;16:201-7.
- Centers for Disease Control and Prevention (CDC). Prevalence of autism spectrum disorders – Autism and Developmental Disabilities Monitoring Network, 14 sites, 2008. 2012. Contract No.: SS03.
- Centers for Disease Control and Prevention (CDC). Identified Prevalence of Autism Spectrum Disorder 2016 [Available from: www.cdc.gov/ncbddd/autism/data.html]
- Chan AW, Tetzlaff JM, Gøtzsche PC, Altman DG, Mann H, Berlin JA, et al. SPIRIT 2013 explanation and elaboration: guidance for protocols of clinical trials. *BMJ (Clinical research ed)*. 2013;346:1-42.
- Chan F, Strausser, D., Maher, P., Lee, E.J., Jones, R., & Johson, T. Demand-side factors related to the employment of people with disabilities: A survey of employers in the Midwest region of the United States. *Journal of Occupational Rehabilitation*. 2010;20:412-9.
- Chen JL, Leader, G., Sung, C., & Leahy, M. Trends in Employment for Individuals with Autism Spectrum Disorder: A Review of the Research Literature. *Review Journal of Autism and Developmental Disorders*. 2015;2(2):115-27.
- Chen JL, Sung, C., & Pi, S. Vocational Rehabilitation Service Patterns and Outcomes for Individuals with Autism of Different Ages. *Journal of Autism and Developmental Disorders*. 2015;45(9):3015-29.
- Choque Olsson N, Rautio D, Asztalos J, Stoetzer U, Bölte S. Social skills group training in high-functioning autism: A qualitative responder study. *Autism*. 2016;20(8):995-1010.
- Chown N, & Beavan, N. Intellectually capable but socially excluded? A review of the literature and research on students with autism in further education. *Journal of Further and Higher Education*. 2012;36(4):477-93.
- Cieza A, Brockow T, Ewert T, Amman E, Kollerits B, Chatterji S, et al. Linking health-status measurements to the International Classification of Functioning, Disability and Health. *Journal of Rehabilitation Medicine*. 2002;34(5):205-10.
- Cieza A, Ewert T, Berdirhan Üstün T, Chatterji S, Kostanjsek N, Stucki G. Development of ICF Core Sets for patients with chronic conditions. *Journal of Rehabilitation Medicine*. 2004;36(SUPPL. 44):9-11.
- Cieza A, Geyh S, Chatterji S, Kostanjsek N, Üstün B, Stucki G. ICF linking rules: An update based on lessons learned. *Journal of Rehabilitation Medicine*. 2005;37(4):212-8.
- Cimera RE. The monetary benefits and costs of hiring supported employees: a primer. *Journal of Vocational Rehabilitation*. 2002;17(1):23-32.
- Cimera RE. The monetary benefits and costs of hiring supported employees: Revisited. *Journal of Vocational Rehabilitation*. 2006;24(3):137-44.
- Cimera RE, & Cowan, R. J. The costs of services and employment outcomes achieved by adults with autism in the US. *Autism*. 2009;13(3):285-302.
- Cimera RE. The monetary benefits and costs of hiring supported employees: a pilot study. *Journal of Vocational Rehabilitation*. 2009;30(2):111-9.
- Cimera RE, Wehman P, West M, Burgess S. Do sheltered workshops enhance employment outcomes for adults with autism spectrum disorder? *Autism : the international journal of research and practice*. 2012;16(1):87-94.
- Clifton DO, . & Harter, J.K. . Investing in strengths. Cameron KS, Dutton, J. E., & Quinn, R.E., editor. San Francisco: Berrett-Koehler; 2003.
- Combs GM. Meeting the leadership challenge of a diverse and pluralistic workplace: Implications of self-efficacy for diversity training. *Journal of Leadership & Organizational Studies*. 2002;8(4):1-16.

- Disability Discrimination Act, (1992).
- Cooperative Research Centre for Living with Autism. Inclusive research practice guides and checklists for autism research: Version 2. Brisbane, Queensland: Autism CRC Ltd; 2016.
- Cooperative Research Centre for Living with Autism (Autism CRC). Autism CRC 2014 [Available from: <https://www.autismcrc.com.au/>].
- Copeland J. The impact of disability in the workplace: An assessment of employer attitudes toward people with disabilities and the Americans with Disabilities Act. unpublished: Capella University; 2007.
- Coster WJ. Making the best match: Selecting outcome measures for clinical trials and outcome studies. *American Journal of Occupational Therapy*. 2013;67(2):162-70.
- Council of Australian Governments. National Disability Strategy 2010-2020; 2010.
- Council of Australian Governments. National Disability Strategy 2010-2020: An initiative of the Council of Australian Governments. Canberra: ACT; 2011.
- Craig P, Dieppe, P., Macintyre, S., Mitchie, S., Nazareth, I., & Pettigrew, M. Developing and evaluating complex interventions: The new Medical Research Council guidance. *BMJ*. 2008;337(7676):979-83.
- Daniali SS, Shahnaz, H., Kazemi, S., & Marzbani, E. The Effect of Educational Intervention on Knowledge and Self-efficacy for Pain Control in Patients with Multiple Sclerosis. *Materia Socio-Medica*. 2016;28(4):283-7.
- Daudt HML, Van Mossel, C., & Scott, S. J. Enhancing the scoping study methodology: A large, inter-professional team's experience with Arksey and O'Malley's framework. *BMC Medical Research Methodology*. 2013;13(1).
- de Schipper E, Lundequist A, Coghill D, de Vries PJ, Granlund M, Holtmann M, et al. Ability and Disability in Autism Spectrum Disorder: A Systematic Literature Review Employing the International Classification of Functioning, Disability and Health-Children and Youth Version. *Autism research : Official Journal of the International Society for Autism Research*. 2015;8(6):782-94.
- de Schipper E, Mahdi S, de Vries P, Granlund M, Holmann M, Karande S, et al. Functioning and disability in Autism Spectrum Disorder: A worldwide survey of experts. *Autism Research*. 2016;00(00):1-11.
- de Schipper E, Mahdi S, de Vries P, Granlund M, Holtmann M, Karande S, et al. Functioning and disability in autism spectrum disorder: A worldwide survey of experts. *Autism Research*. 2016;9(9):959-69.
- Dempsey, I, & Nankervis, K. Conception of disability. In: Dempsey I, & Nankervis, K., editor. *Community Disability Services: An evidence-based approach to practice*. Sydney, Australia: UNSW Press; 2006. p. 3-26.
- Department of Industry Innovation and Science. Australian Industry Report 2016. Canberra, ACT: Office of the Chief Economist, Department of Industry, Innovation and Science; 2016.
- Department of Social Services. A new system for better employment and social outcomes: Interim report of the Reference Group on Welfare Reform to the Minister for Social Services. Canberra: Department of Social Services; 2014.
- Department of Social Services. JobAccess: Driving disability employment 2017 [Available from: <https://www.jobaccess.gov.au/>].
- DePoy EG, & Gitlin, L.N. . Introduction to research: understanding and applying multiple strategies. 3rd ed. St. Louis: Elsevier Mosby; 2005.
- Domzal C, Houtenville A, Sharma R. Survey of employer perspectives on the employment of people with disabilities: Technical report. (prepared under contract to the Office of Disability and Employment Policy, U.S. Department of Labor). McLean, VA: CESSI; 2008.

- Dotson WH, Richman DM, Abby L, Thompson S, Plotner A. Teaching skills related to self-employment to adults with developmental disabilities: An analog analysis. *Research in Developmental Disabilities*. 2013;34(8):2336-50.
- Eaves LC, & Ho, H. H. Young adult outcome of autism spectrum disorders. *Journal of Autism and Developmental Disorders*. 2008;38:739-47.
- Ellenkamp J, Brouwers, E., Embregts, P., Joosen, M., & Weeghel, J. Work Environment-Related Factors in Obtaining and Maintaining Work in a Competitive Employment Setting for Employees with Intellectual Disabilities: A Systematic Review. *Journal of Occupational Rehabilitation*. 2016;26(1):56-69.
- Entwistle VA, Renfrew, M. J., Yearley, S., Forrester, J., & Lamont, T. Lay perspectives: Advantages for health research. *British Medical Journal*. 1998;316(7129):463-6.
- Erickson WA, von Schrader, S., Bruyère, S,M., & VanLooy, S,A. The Employment Environment: Employer Perspectives, Policies, and Practices Regarding the Employment of Persons With Disabilities. *Rehabilitation Counseling Bulletin*. 2014;57(4):195-208.
- Evans R, Scourfield J, Murphy S. Pragmatic, formative process evaluations of complex interventions and why we need more of them. *Journal of Epidemiology and Community Health*. 2015;69(10):925.
- Fabian ES, Luecking RG, Tilson GP. Employment and job placement issue-Employer and rehabilitation personnel perspectives on hiring persons with disabilities-Implications for job development. *Journal of Rehabilitation*. 1995;61(1):42-9.
- Faes MC, Reelick, M.F., Esselink, R.A., & Rikkert, M. G. O. Developing and Evaluating Complex Healthcare Interventions in Geriatrics: The Use of the Medical Research Council Framework Exemplified on a Complex Fall Prevention Intervention. *Journal of the American Geriatrics Society*. 2010;58(11):2212-21.
- Fagard RH. Advantages and disadvantages of the meta-analysis approach. *Journal of Hypertension, Supplement*. 1996;14(2):S9-S13.
- Fair Work Australia. Employee type 2017 [Available from: <https://www.fairwork.gov.au/employee-entitlements/types-of-employees>].
- Farley MA, McMahon WM, Fombonne E, Jenson WR, Miller J, Gardner M, et al. Twenty-year outcome for individuals with autism and average or near-average cognitive abilities. *Autism Research*. 2009;2(2):109-18.
- Finger ME, Escorpizo, R., Glassel, A., Gmunder, H. P., Luckenkemper, M., Chan. C., et al. ICF core set for vocational rehabilitation: results of an international consensus conference. *Disability and Rehabilitation*. 2012;34(5):429-38.
- Fitzgerald S, & Schutte, N.S. Increasing transformational leadership through enhancing self-efficacy. *The Journal of Management Development*. 2010;29(5):495-505.
- Fleming AR, Fairweather JS, Leahy MJ. Quality of Life As a Potential Rehabilitation Service Outcome: The Relationship Between Employment, Quality of Life, and Other Life Areas. *Rehabilitation Counseling Bulletin*. 2013;57(1):9-22.
- Fleming J, Kuipers, P., Foster, M., Smith, S., & Doig, E. Evaluation of an outpatient, peer group intervention for people with acquired brain injury based on the ICF 'Environment' dimension. *Disability & Rehabilitation*. 2009;31(20):1666-75.
- Flom PL, Supino, P.G. & Philip Ross, N. Constructing and evaluating self-report measures. In: Supino PG, & Borer, J.S., editor. *Principles of research methodology: A guide for clinical investigators*. New York: Springer; 2012. p. 147-75.
- Foley KR, Dyke P, Girdler S, Bourke J, Leonard H. Young adults with intellectual disability transitioning from school to post-school: A literature review framed within the ICF. *Disability & Rehabilitation*. 2012;34(20):1747-64.
- Foley K-R, Girdler S, Bourke J, Jacoby P, Llewellyn G, Einfeld S, et al. Influence of the Environment on Participation in Social Roles for Young Adults with Down Syndrome. *PLoS One*. 2014;9(9):e108413.

- Fraser R, Ajzen, I., Johnson, K., Hebert, J., & Chan, F. Understanding employers' hiring intention in relation to qualified workers with disabilities. *Journal of Vocational Rehabilitation*. 2011;35(1):1-11.
- Fusch PI, Ness LR. Are we there yet? Data saturation in qualitative research. *Qualitative Report*. 2015;20(9):1408-16.
- Gal E, Landes E, Katz N. Work performance skills in adults with and without high functioning autism spectrum disorders (HFASD). *Research in Autism Spectrum Disorders*. 2015;10:71-7.
- Gal E, Meir AB, Katz N. Development and Reliability of the Autism Work Skills Questionnaire (AWSQ). *The American Journal of Occupational Therapy*. 2013;67(1):e1-5.
- Gal E, Selanikyo E, Erez ABH, Katz N. Integration in the vocational world: How does it affect quality of life and subjective well-being of young adults with ASD. *International Journal of Environmental Research and Public Health*. 2015;12(9):10820-32.
- Garcia-Villamizar D, & Hughes, C. Supported employment improves cognitive performance in adults with autism. *Journal of Intellectual Disability Research*. 2007;51:142-50.
- Garcia-Villamizar D, Wehman P, Navarro MD. Changes in the quality of autistic people's life that work in supported and sheltered employment. A 5-year follow-up study. *Journal of Vocational Rehabilitation*. 2002;17:309-12.
- Gates L, Akabas, S., & Kantrowitz, W. . Supervisors' role in successful job maintenance: A target for rehabilitation counselor efforts. . *Journal of Applied Rehabilitation Counseling*. 1996;27(3):60-6.
- Gates LB. The role of the supervisor in successful adjustment to work with a disabling condition: Issues for disability policy and practice. *Journal of Occupational Rehabilitation*. 1993;3(4):179-90.
- Gentry T, Kriner, R., Sima, A., McDonough, J., & Wehman, P. Reducing the Need for Personal Supports Among Workers with Autism Using an iPod Touch as an Assistive Technology: Delayed Randomized Control Trial. *Journal of Autism & Developmental Disorders*. 2015;45(3):669-84.
- Gentry T, Lau S, Molinelli A, Fallen A, Kriner R. The Apple iPod Touch as a vocational support aid for adults with autism: Three case studies. *Journal of Vocational Rehabilitation*. 2012;37(2):75-85.
- Gerhardt F, & Lainer, I. Addressing the Needs of Adolescents and Adults with Autism: A Crisis on the Horizon. *Journal of Contemporary Psychotherapy*. 2011;41(1):37-45.
- Gilbride D, Stensrud, R., Ehlers, C., Evans, E., & Peterson, C. Employers' attitudes toward hiring persons with disabilities and vocational rehabilitation services. *Journal of Rehabilitation*. 2000;66(4):17-23.
- Gilbride D, Stensrud, R., Vandergoot, D., & Golden, K. Identification of the characteristics of work environments and employers open to hiring and accommodating people with disabilities. *Rehabilitation Counseling Bulletin*. 2003;46(3):130-90.
- Gilson C, & Carter, E. Promoting Social Interactions and Job Independence for College Students with Autism or Intellectual Disability: A Pilot Study. *Journal of Autism & Developmental Disorders*. 2016;46(11):3583-96.
- Gladh L, & Sjölund, A. The Validation Process: A useful tool to visualize abilities and enhance the possibilities of paid employment for people with ASD. *Journal of Vocational Rehabilitation*. 2014;41(1):71-6.
- Glaser BG, & Strauss, A. L. *The discovery of grounded theory: Strategies for qualitative theory*. Chicago: Aldine1973.
- Glasman LR, & Albarracín, D. . Forming attitudes that predict future behavior: A meta-analysis of the attitude behavior relation. *Psychological Bulletin*. 2006;132(5):778–822.
- Graffam J, Smith K, Shinkfield A, Polzin U. Employer benefits and costs of employing a person with a disability. *Journal of Vocational Rehabilitation*. 2002;17(4):251-63.

- Graham ID, Logan J, Harrison MB, Straus SE, Tetroe J, Caswell W, et al. Lost in knowledge translation: time for a map? *The Journal of continuing education in the health professions*. 2006;26(1):13-24.
- Green JH, Brooke V. Recruiting and retaining the best from America's largest untapped talent pool. *Journal of Vocational Rehabilitation*. 2001;16(2):83-8.
- Greenhalgh T, Robert, G. Macfarlane, F., Bate, P., & Kyriakidou, O. Diffusion of innovations in service organizations: Systematic review and recommendations. *Milbank Quarterly*. 2004;82(4):581-629.
- Greenwood R, & Johnson, V. A. Employer perspectives on workers with disabilities. *Journal of Rehabilitation*. 1987;53(3):37-45.
- Grimshaw JM, Eccles, M. P., Lavis, J. N., Hill, S. J., & Squires, J. E. Knowledge translation of research findings. *Implementation Science*. 2012;7(1).
- Gwele NS. Diversity management in the workplace: beyond compliance. *Curationis*. 2009;32(2):4-10.
- Hagner D, & Cooney, B. Building employer capacity to support employees with severe disabilities in the workplace. *Work*. 2003;21(1):77-82.
- Hagner D, & Cooney, B. F. "I do that for everybody!": Supervising employees with autism. *Focus on Autism and Other Developmental Disabilities*. 2005;20(2):91-7.
- Ham W, McDonough, J., Molinelli, A., Schall, C., & Wehman, P. Employment supports for young adults with autism spectrum disorder: Two case studies. *Journal of Vocational Rehabilitation*. 2014;40:117-24.
- Hardeman W, Sutton S, Griffin S, Johnston M, White A, Wareham NJ, et al. A causal modelling approach to the development of theory-based behaviour change programmes for trial evaluation. *Health Education Research*. 2005;20(6):676-87.
- Hartnett HP, Stuart, H., Thurman, H., Loy, B., & Batiste, L. C. Employers' perceptions of the benefits of workplace accommodations: reasons to hire, retain and promote people with disabilities. *Journal of Vocational Rehabilitation*. 2011;34(1):17-23.
- Hayes GR, Custodio VE, Haimson OL, Nguyen K, Ringland KE, Ulgado RR, et al. Mobile video modeling for employment interviews for individuals with autism. *Journal of Vocational Rehabilitation*. 2015;43(3):275-87.
- Hedley D, Uljarevic, M., Cameron, L., Halder, S., Richdale, A., & Dissanayake, C. . Employment programmes and interventions targeting adults with autism spectrum disorder: A systematic review. *Autism*. 2016:1-13.
- Heinemann A, Lai J-S, Wong A, Dashner J, Magasi S, Hahn E, et al. Using the ICF's environmental factors framework to develop an item bank measuring built and natural environmental features affecting persons with disabilities. *Quality of Life Research*. 2016;25(11):2775-86.
- Hendricks D. Employment and adults with autism spectrum disorders: Challenges and strategies for success. *Journal of Vocational Rehabilitation*. 2010;32(2):125-34.
- Hendricks DR, & Wehman, P. Transition from school to adulthood for youth with autism spectrum disorders: Review and recommendations. *Focus on Autism and Other Developmental Disabilities*. 2009;24(2):77-88.
- Henninger NA, & Taylor, J. L. Outcomes in adults with autism spectrum disorders: a historical perspective. *Autism*. 2013;17(1):103-16.
- Hernandez B, & McDonald, K. Exploring the Costs and Benefits of Workers with Disabilities. *Journal of Rehabilitation*. 2010;76(3):15-23.
- Hernandez B, Cometa MJ, Velcoff J, Rosen J, Schober D, Luna RD. Perspectives of people with disabilities on employment, vocational rehabilitation, and the Ticket to Work program. *Journal of Vocational Rehabilitation*. 2007;27(3):191-201.
- Hernandez B, Keys C, Balcazar F. Employer attitudes toward workers with disabilities and their ADA employment rights: A literature review. *Journal of Rehabilitation*. 2000;66(4):4-16.

- Hernandez B, McDonald K, Lepera N, Shahna M, Wang TA, Levy JM. Moving beyond misperceptions: The provision of workplace accommodations. *Journal of Social Work in Disability and Rehabilitation*. 2009;8(3-4):189-204.
- Higgins KK, Koch LC, Boughfman EM, Vierstra C. School-to-work transition and Asperger Syndrome. *Work*. 2008;31(3):291-8.
- Hill DA, Belcher, L., Brigman, H.E., Renner, S., & Stephens, B. The Apple iPad™ as an Innovative Employment Support for Young Adults with Autism Spectrum Disorder and Other Developmental Disabilities. *Journal of Applied Rehabilitation Counseling*. 2013;44(1):28-37.
- Hillier A, Campbell, H., Mastriani, K., Izzo, M. V., Kool-Tucker, A.K., Cherry, L et al. Two-Year Evaluation of a Vocational Support Program for Adults on the Autism Spectrum. *Career Development for Exceptional Individuals*. 2007;30(1):125-34.
- Holman H, & Lorig, K. Perceived self-efficacy in self-management of chronic disease. In: Schwarzer R, editor. *Self-efficacy: Thought control of action*. New York: Routledge; 2014. p. 305-24.
- Holwerda A, van der Klink, J. J., Groothoff, J. W., & Brouwer, S. Predictors for work participation in individuals with an Autism spectrum disorder: a systematic review. *J Occup Rehabil*. 2012;22(3):333-52.
- Horner S, Rew, L., & Torres, R. Enhancing intervention fidelity: A means of strengthening study impact. *Journal for Specialists in Pediatric Nursing*. 2006;11(2):80-9.
- Houtenville A, & Kalargyrou, V. People with disabilities: Employers' perspectives on recruitment practices, strategies, and challenges in leisure and hospitality. *Cornell Hospitality Quarterly*. 2012;53(1):40-52.
- Houtenville A, & Kalargyrou, V. Employers' Perspectives about Employing People with Disabilities: A Comparative Study across Industries. *Cornell Hospitality Quarterly*. 2015;56(2):168-79.
- Howlin P, Alcock, J., & Burkin, C. An 8-year follow-up of a specialist supported employment service for high-ability adults with autism or Asperger syndrome. *Autism*. 2005;9:533-49.
- Howlin P, & Moss, P. Adults with autism spectrum disorders. *The Canadian Journal of Psychiatry*. 2012;57(5):275-83.
- Howlin P, Moss, P., Savage, S., & Rutter, M. Social Outcomes in Mid-to Late adulthood among individuals diagnosed with Autism and average nonverbal IQ as children. *Journal of the American Academy of Child & Adolescent Psychiatry*. 2013;52(6):572-81.
- Howlin P, Arciuli J, Begeer S, Brock J, Clarke K, Costley D, et al. Research on adults with autism spectrum disorder: Roundtable report. *Journal of Intellectual & Developmental Disability*. 2015;40(4):388-93.
- Howlin P, Goode S, Hutton J, Rutter M. Adult outcome for children with autism. *Journal of Child Psychology and Psychiatry*. 2004;45(2):212-29.
- Hurlbutt K, & Chalmers, L. Employment and Adults with Asperger Syndrome. *Focus on Autism and Other Developmental Disabilities*. 2004;19(4):215-22.
- Idring S, Lundberg M, Sturm H, Dalman C, Gumpert C, Rai D, et al. Changes in Prevalence of Autism Spectrum Disorders in 2001–2011: Findings from the Stockholm Youth Cohort. *Journal of Autism and Developmental Disorders*. 2015;45(6):1766-73.
- IBM Corporation. *IBM SPSS statistics for Windows*. 24.0 ed. Armonk, New York: IBM Corporation; 2016.
- Isaac C, Kaatz, A., Lee, B., & Carnes, M. An Educational Intervention Designed to Increase Women's Leadership Self-Efficacy. *CBE - Life Sciences Education*. 2012;11(3):307-22.

- Jacob A, Scott, M., Falkmer, M., & Falkmer, T. The Costs and Benefits of Employing an Adult with Autism Spectrum Disorder: A Systematic Review. *PLoS ONE*. 2015;10(10):e0139896.
- Järbrink K, McCrone P, Fombonne E, Zandén H, Knapp M. Cost-impact of young adults with high-functioning autistic spectrum disorder. *Research in Developmental Disabilities*. 2007;28(1):94-104.
- Jasper CR, Waldhart P. Employer attitudes on hiring employees with disabilities in the leisure and hospitality industry: Practical and theoretical implications. *International Journal of Contemporary Hospitality Management*. 2013;25(4):577-94.
- JobAccess. Subsidised wages for people with disability Department of Social Services 2016 [Available from: <https://www.jobaccess.gov.au/employers/subsidised-wages-people-with-disability>].
- Joffe H, & Yardley, L. . Content and thematic analysis. In: Marks DF, & Yardely, L., editor. *Research methods for clinical and health psychology*. London, UK: Sage; 2004. p. 56-64.
- Ju S, Roberts, E., & Zhang, D. Employer attitudes toward workers with disabilities: A review of research in the past decade. *Journal of Vocational Rehabilitation*. 2013;38(2):113-23.
- Kastner M, & Straus, S.E. Application of the Knowledge-to-Action and Medical Research Council frameworks in the development of an osteoporosis clinical decision support tool. *Journal of Clinical Epidemiology*. 2012;65(11):1163-70.
- Katz N, Dejak, I., & Gal, E. Work performance evaluation and QoL of adults with High Functioning Autism Spectrum Disorders (HFASD). *Work*. 2015;51(4):887-92.
- Kaye H, Jans L, Jones E. Why Don't Employers Hire and Retain Workers with Disabilities? *Journal of Occupational Rehabilitation*. 2011;21(4):526-36.
- Keel JH, Mesibov GB, Woods AV. TEACCH-Supported Employment Program. *Journal of Autism and Developmental Disorders*. 1997;27(1):3-9.
- Kellems RO, & .Morningstar, M.E. Using video modeling delivered through iPod to teach vocational tasks to young adults with autism spectrum disorders. *Career Development and Transition for Exceptional Individuals*. 2012;35(3):155-67.
- Kenny L, Hattersley, C., Molins, B., Buckley, C., Povey, C., & Pellicano, E. Which terms should be used to describe autism? Perspectives from the UK autism community. *Autism*. 2016;20(4):442-62.
- King S, Rosenbaum PL, King G. *The Measure of Processes of Care (MPOC): a means to assess family-centred behaviours of health care providers*. Hamilton: McMaster University: Neurodevelopmental Clinical Research Unit; 1995.
- Kirby AV, Baranek, G. T., & Fox, L. Longitudinal predictors of outcomes for adults with autism spectrum disorder: Systematic review. *OTJR Occupation, Participation and Health*. 2016;36(2):55-64.
- Kirsh B. Organizational culture, climate and person-environment fit: relationships with employment outcomes for mental health consumers. *Work*. 2000;14(2):109-22.
- Kmet L, Lee, R., & Cook, L. *Standard quality assessment criteria for evaluating primary research papers from a variety of fields*. Edmonton: Alberta: Heritage Foundation for Medical Research (AHFMR). 2004.
- Knapp M, Romeo R, Beecham J. Economic cost of autism in the UK. *Autism*. 2009;13(3):317-36.
- Kregel J, & Tomiyasu, Y. *General Scale: [Form B.] Joint project of the Rehabilitation Research and Training Center on Supported Employment at Virginia Commonwealth University*. 1992.
- Kregel J, & Tomiyasu, Y. Employers' attitudes toward workers with disabilities. *Journal of Vocational Rehabilitation*. 1994;4(3):165-73.

- Kregel J. Why it pays to hire workers with developmental disabilities. *Focus on Autism and Other Developmental Disabilities*. 1999;14(3):130-2.
- Kregel JT, Y. . Employers' Attitudes toward Workers with Disabilities. *Journal of Vocational Rehabilitation*. 1994;4(3):165-73.
- Krieger B, Kinebanian, A., Prodinge, B., & Heigl, F. Becoming a member of the work force: perceptions of adults with Asperger Syndrome. *Work*. 2012;43(2):141-57.
- Lattimore L, Parsons, M., & Reid, D. Enhancing job-site training of supported workers with autism: A reemphasis on simulation. *Journal of Applied Behavior Analysis*. 2006;39(1):91-102.
- Lattimore LP, Parsons, M.B., & Reid, D., H. Simulation training of community job skills for adults with autism: a further analysis. *Behavior Analysis in Practice*. 2008;1:24-9.
- Lawer L, Brusilovskiy, E., & Salzer, M. S., Mandell DS. Use of vocational rehabilitative services among adults with autism. *J Autism Dev Disord*. 2009;39(3):487-94.
- Lee GK, Carter EW. Preparing transition-age students with high-functioning autism spectrum disorders for meaningful work. *Psychology in the Schools*. 2012;49(10):988-1000.
- Lee L, Packer, T. L., Tang, S. H., & Girdler, S. Self-management education programs for age-related macular degeneration: a systematic review. *Australasian Journal on Ageing*. 2008;27(4):170-6.
- Leonard H, Dixon G, Whitehouse AJO, Bourke J, Aiberti K, Nassar N, et al. Unpacking the complex nature of the autism epidemic. *Research in Autism Spectrum Disorders*. 2010;4(4):548-54.
- Levac D, Colquhoun, H., & O'Brien, K. K. Scoping studies: Advancing the methodology. *Implementation Science*. 2010;5(1).
- Levy A, & Perry, A. Outcomes in adolescents and adults with autism: A review of the literature. *Research in Autism Spectrum Disorders*. 2011;5(4):1271-82.
- Liu KP, Wong D, Chung AC, Kwok N, Lam MK, Yuen CM, et al. Effectiveness of a workplace training programme in improving social, communication and emotional skills for adults with autism and intellectual disability in Hong Kong--a pilot study. *Occupational Therapy International*. 2013;20(4):198-204.
- Livermore G, & Goodman, N. . A review of recent evaluation efforts associated with programs and policies designed to promote the employment of adults with disabilities. Ithaca, NY: Cornell University, Rehabilitation Research and Training Center on Employment Policy; 2009.
- Locke J, Rotheram-fuller E, Kasari C. Exploring the Social Impact of Being a Typical Peer Model for Included Children with Autism Spectrum Disorder. *Journal of Autism and Developmental Disorders*. 2012;42(9):1895-905.
- Lopez B, & Keenan, L. Barriers to employment in autism: Future challenges to implementing the Adult Autism Strategy. *Autism Research Network*; 2014.
- Lorenz T, & Heinitz, K. Aspergers - Different, Not Less: Occupational Strengths and Job Interests of Individuals with Asperger's Syndrome. *Plos One*. 2014;9(6).
- Lorenz T, Frischling C, Cuadros R, Heinitz K. Autism and Overcoming Job Barriers: Comparing Job-Related Barriers and Possible Solutions in and outside of Autism-Specific Employment. *PLoS ONE*. 2016;11(1):e0147040.
- Luecking RG. Emerging employer views of people with disabilities and the future of job development. *Journal of Vocational Rehabilitation*. 2008;29(1):3-13.
- Lynas L. Project ABLE (Autism: Building Links to Employment): A specialist employment service for young people and adults with an autism spectrum condition. *Journal of Vocational Rehabilitation*. 2014;41(1):13-21.
- Maddux JE. Self-efficacy theory: An introduction. In: Maddux JE, editor. *Self-efficacy, adaptation, and adjustment: Theory, research, and application*. New York: Plenum Press; 1995. p. 3-33.

- Magiati I, Tay XW, Howlin P. Cognitive, language, social and behavioural outcomes in adults with autism spectrum disorders: A systematic review of longitudinal follow-up studies in adulthood. *Clinical Psychology Review*. 2014;34(1):78-86.
- Mank D, Cioffi, A., & Yovanoff, P. Analysis of the typicalness of supported employment jobs, natural supports, and wage and integration outcomes. *Mental Retardation*. 1997;35(3):185-97.
- Marchand E, Stice E, Rohde P, Becker CB. Moving from efficacy to effectiveness trials in prevention research. *Behaviour Research and Therapy*. 2011;49(1):32-41.
- Martins AC. Using the International Classification of Functioning, Disability and Health (ICF) to address facilitators and barriers to participation at work. *Work*. 2015;50(4):585-93.
- Matons JL, & Kowlowski, A.M. The increasing prevalence of autism spectrum disorders. *Research in Autism Spectrum Disorders*. 2011;5:418-25.
- Mautz D, Storey K, Certo N, J. Increasing integrated workplace social interactions: The effects of job modification, natural supports, adaptive communication instruction, and job coach training. *Journal of the American Society of Hypertension*. 2001;26(4):257-69.
- Mavranouzouli I, Megnin-Viggars O, Cheema N, Howlin P, Baron-Cohen S, Pilling S. The cost-effectiveness of supported employment for adults with autism in the United Kingdom. *Autism*. 2013;0(0):1-10.
- Mawhood L, & Howlin, P. The Outcome of a Supported Employment Scheme for High-Functioning Adults with Autism or Asperger Syndrome. *Autism*. 1999;3(3):229-54.
- May C. Towards a general theory of implementation. *Implementation Science*. 2013;8(1).
- McBride N. *Intervention research: A practical guide for developing evidence-based school prevention programmes*. Singapore: Springer; 2016.
- McConachie H, Parr JR, Glod M, Hanratty J, Livingstone N, Oono IP, et al. Systematic review of tools to measure outcomes for young children with autism spectrum disorder. *Health Technology Assessment*. 2015;19(41):1-538.
- McCurdy EE, & Cole, C. L. Use of a Peer Support Intervention for Promoting Academic Engagement of Students with Autism in General Education Settings. *Journal of Autism and Developmental Disorders*. 2014;44(4):883-93.
- McDonough JT, & Revell, G. Accessing employment supports in the adult system for transitioning youth with autism spectrum disorders. *Journal of Vocational Rehabilitation*. 2010;32:89-100.
- McDougall J, Wright, V., & Rosenbaum, P. The ICF model of functioning and disability: incorporating quality of life and human development. *Developmental Neurorehabilitation*. 2010;13(3):204-11.
- Medical Research Council. *A framework for development and evaluation of RCTs for complex interventions to improve health*. MRC; 2000.
- Medical Research Council. *Developing and evaluating complex interventions: new guidance*. 2008.
- Medical Research Council. *Process evaluation of complex interventions: UK Medical Research Council (MRC) guidance*. MRC; 2015.
- Melville CA, Cooper S, Morrison J, Finlayson J, Allan L, Robinson N, et al. The outcomes of an intervention study to reduce the barriers experienced by people with intellectual disabilities accessing primary health care services. *Journal of Intellectual Disability Research*. 2006;50(1):11-7.
- Migliore A, Timmons, J., Butterworth, J., & Lugas, J. Predictors of Employment and Postsecondary Education of Youth With Autism. *Rehabilitation Counseling Bulletin*. 2012;55(3):176-84.

- Migliore A, Butterworth, J., & Zalewska, A. Trends in Vocational Rehabilitation Services and Outcomes of Youth With Autism: 2006–2010. *Rehabilitation Counseling Bulletin*. 2014;57(2):80-9.
- Moore GF, Audrey S, Barker M, Bond L, Bonell C, Hardeman W, et al. Process evaluation of complex interventions: Medical Research Council guidance. *BMJ : British Medical Journal*. 2015;350.
- Moore GF, Audrey S, Barker M, Bond L, Bonell C, Hardeman W, et al. Process evaluation of complex interventions: Medical Research Council guidance. *BMJ (Online)*. 2015;350.
- Mor Barak ME. The inclusive workplace: an ecosystems approach to diversity management. *Social Work*. 2000;45(4):339-53.
- Morgan L, Leatzow A, Clark S, Siller M. Interview Skills for Adults with Autism Spectrum Disorder: A Pilot Randomized Controlled Trial. *Journal of Autism & Developmental Disorders*. 2014;44(9):2290-300.
- Morgan RL, & Alexander, M. The employer's perception: employment of individuals with developmental disabilities. *Journal of Vocational Rehabilitation*. 2005;23(1):39-49.
- Morgan RL, & Schultz, J.C. Towards an Ecological, Multi-Modal Approach to Increase Employment for Young Adults with Autism Spectrum Disorder. *Journal of Applied Rehabilitation Counseling*. 2012;43(1):27-35.
- Mottron L, Dawson, M., & Soulie`res, I. Enhanced perception in savant syndrome: Patterns, structure and creativity. *Philosophical Transactions of the Royal Society*. 2009;B 364:1385–91.
- Müller E, Schuler, A., Burton, B. A., & Yates, G. B. Meeting the vocational support needs of individuals with Asperger syndrome and other autism spectrum disabilities. *Journal of Vocational Rehabilitation*. 2003;18:163-75.
- Müller E, & Vangilder, R. The relationship between participation in Project SEARCH and job readiness and employment for young adults with disabilities. *Journal of Vocational Rehabilitation*. 2014;40(1):15-26.
- National Health and Medical Research Council. Australian code for responsible conduct of research. Canberra: Commonwealth of Australia; ; 2007.
- Nesbitt S. Why and why not? Factors influencing employment for individuals with Asperger syndrome. *Autism*. 2000;4(4):357-69.
- Nicholas D, Attridge, M., Zwaigenbaum, L., & Clarke, M. Vocational support approaches in autism spectrum disorder: A synthesis review of the literature. *Autism*. 2014.
- Nilsen P. Making sense of implementation theories, models and frameworks. *Implementation Science*. 2015;10(1).
- Nord DK, Stancliffe RJ, Nye-Lengerman K, Hewitt AS. Employment in the community for people with and without autism: A comparative analysis. *Research in Autism Spectrum Disorders*. 2016;24:11-6.
- NVivo. NVivo qualitative data analysis software. 11 ed: QSR International Pty Ltd; 2015.
- Oakley A, Strange, V., Bonell, C., Allen, E., & Stephenson, J. Process evaluation in randomised controlled trials of complex interventions. *British Medical Journal*. 2006;332:413-6.
- O'Brien M, & Daggett, J.A. *Beyond the Autism Diagnosis: A Professional's Guide to Helping Families*. Baltimore, MD Brookes Publishing Company 2006 2006. 368 p.
- Olney MF. Working with autism and other social-communication disorders. *Journal of Rehabilitation*. 2000;66(4):51-6.
- Organisation for Economic Co-operation and Development. *Sickness, disability and work: Breaking the barriers*. Paris: OECD; 2010.
- Organisation for Economic Co-operation and Development (OECD). *Sickness, Disability and Work: Breaking the Barriers*. Paris: OECD Publishing; 2010.

- Organisation for Economic Co-operation Development. *Sickness, Disability and Work: Keeping on Track in the Economic Downturn*. Organisation for Economic Co-operation and Development Directorate for Employment, Labour and Social Affairs. 2009:1-44.
- Pellicano L, Dinsmore, A., & Charman, T. . *A future made together: Shaping autism research in the UK*. London: Institute of Education; 2013.
- Petty DM, & Fussell, E. M. *Employer Attitudes and Satisfaction with Supported Employment. Focus on Autism and Other Developmental Disabilities*. 1997;12(1):15-22.
- Portney LG, & Watkins, M. P. *Foundations of Clinical Research: Applications to Practice*. 3rd ed. Upper Saddle River: New Jersey: Pearson: Prentice Hall; 2009.
- Price LR. *Psychometric Methods : Theory into Practice*: New York : Guilford Publications; 2017.
- Qualtrics. *Qualtrics November 2015 ed*. Provo, Utah, USA: Qualtrics; 2005.
- Rashid M, Hodgetts S, Nicholas D. *Building Employers' Capacity to Support Vocational Opportunities for Adults with Developmental Disabilities*. *Review Journal of Autism and Developmental Disorders*. 2017;4(2):165-73.
- Rauch A, Lückenkemper, M., & Cieza, A. . *Introduction to the international classification of functioning, disability and health*. In: Bickenbach JE, Cieza, A., Rauch, A., & Stucki, G, editor. *ICF Core Sets: Manual for clinical practice*. Göttingen: Hogrefe Publishing; 2012.
- Rausa VC, Moore, D.W., & Anderson, A. *Use of video modelling to teach complex and meaningful job skills to an adult with autism spectrum disorder*. *Developmental Neurorehabilitation*. 2016;19(4):267-74.
- Richards J. *Examining the exclusion of employees with Asperger syndrome from the workplace*. *Personnel Review*. 2012;41(5):630-46.
- Rogan P, Banks B, Howard M. *Workplace supports in practice: As little as possible, as much as necessary*. *Focus on Autism and Other Developmental Disabilities*. 2000;15(1):2.
- Rosenblatt M. *I Exist: The Message from Adults with Autism in England*. London: National Autistic Society; 2008.
- Roux AM, Shattuck, P.T., Cooper, B.P., Anderson, K. A., Wagner, M., & Narendorf, S.C. *Postsecondary employment experiences among young adults with an autism spectrum disorder*. *Journal of the American Academy of Child & Adolescent Psychiatry*. 2013;52(9):931-9.
- Roux AM, Shattuck P, Rast JE, Rava JA, Anderson K. *National Autism Indicators Report: Transition into Young Adulthood*. Philadelphia, PA: Life Course Outcomes Research Program, A.J. Drexel Autism Institute, Drexel University; 2015.
- Russo RJ. *Applying a strengths-based practice approach in working with people with developmental disabilities and their families*. *Families in Society*. 1999;80(1):25-33.
- Ryan C, Bergin, M., Chalder, T., & Wells, J.S.G. *Web-based interventions for the management of stress in the workplace*. *Journal of Occupational Health*. 2017;59(3):215.
- Samorodov A. *Indicators of cost-effectiveness of policy options for workers with disabilities*. Geneva: International Labour Organization; 1996.
- SAS 9.2 [Internet]. SAS Institute Inc. 2008.
- Schall C, Cortijo-Doval, E., Targett, P. S., & Wehman, P. *Applications for youth with autism spectrum disorders*. In: Wehman P, editor. *Life beyond the Classroom: Transition Strategies for Young People with Disabilities*, Fourth Edition. Baltimore, MD: Brookes Publishing Company; 2006. p. 535-75.
- Schall CM. *Positive behavior support: Supporting adults with autism spectrum disorders in the workplace*. *Journal of Vocational Rehabilitation*. 2010;32:109-15.

- Schall CM, Wehman P, Brooke V, Graham C, McDonough J, Brooke A, et al. Employment Interventions for Individuals with ASD: The Relative Efficacy of Supported Employment With or Without Prior Project SEARCH Training. *Journal of Autism and Developmental Disorders*. 2015;45(12):3990-4001.
- Schaller J, & Yang, N. K. Competitive employment for people with autism: correlates of successful closure in competitive and supported employment. *Rehabilitation Counseling Bulletin*. 2005;49(1):4-16.
- Schlieder M, Maldonado N, Baltes B. An Investigation of "Circle of Friends" Peer-Mediated Intervention for Students with Autism. *Journal of Social Change*. 2014;6(1).
- Schneidert M, Hurst, R., Miller, J., & Ustun, Berdirhan. The role of Environment in the International Classification of Functioning, Disability and Health (ICF). *Disability and Rehabilitation*. 2003;25(11-12):588-95.
- Schulz KF, Altman DG, Moher D. CONSORT 2010 Statement: updated guidelines for reporting parallel group randomized trials. *Open Medicine*. 2010;4(1):e60-e8.
- Scott M, Falkmer, M., Girdler, S., & Falkmer, T. Viewpoints on Factors for Successful Employment for Adults with Autism Spectrum Disorder. *PLoS One*. 2015;10(10):e0139281.
- Scott M, Jacob, A., Hendrie, D., Parsons, R., Girdler, S., Falkmer, T., & Falkmer, M. . Employers' perception of the costs and the benefits of hiring individuals with autism spectrum disorder in open employment in Australia. *Plos One*. 2017;12(5):1-16.
- Scott M, Girdler, S., Falkmer, T., & Falkmer, M. Development and evaluation of an autism-specific workplace tool for employers: A trial protocol. *Trials Biomed Central*2017.
- Scott M, Milbourn, B., Falkmer, M., Bölte, S., Halladay, A., Lerner, M., Lounds Taylor, J., & Girdler, S. Factors impacting employment for people with Autism Spectrum Disorders: A scoping review. *Autism*2017.
- Scott M, Falkmer, M., Falkmer, T., & Girdler, S. A comprehensive perspective for the development and evaluation of an autism-specific workplace tool for employers. *Journal for Autism and Developmental Disorders*2017.
- Scott. M, Falkmer, M., Falkmer, T., Girdler, S. Evaluating the effectiveness of an autism-specific workplace tool for employers: A randomised controlled trial. *Journal for Autism and Developmental Disorders*2017.
- Seaman RL, & Cannella-Malone, H.I. Vocational skills interventions for adults with autism spectrum disorder: A review of the literature. *Journal of Developmental and Physical Disabilities*. 2016;28(3):479-94.
- Selb M, Escorpizo R, Kostanjsek N, Stucki G, Üstün B, Cieza A. A guide on how to develop an International Classification of Functioning, Disability and Health Core Set. *European Journal of Physical and Rehabilitation Medicine*. 2015;51(1):105-17.
- Seltzer MM, Shattuck P, Abbeduto L, Greenberg JS. Trajectory of development in adolescents and adults with autism. *Mental Retardation and Developmental Disabilities Research Reviews*. 2004;10(4):234-47.
- Sepideh G, Tayebbeh, R., Mehran, B., & Hamidreza Behnam, V. Effect of a Supportive Educational Program on Self-Efficacy of Mothers with Epileptic Children. *Journal of Evidence-Based Care*. 2016;6(2):49-56.
- Shakespeare T. The social model of disability. In: J. LD, editor. *The Disability Studies Reader*. 4 ed. Hoboken: Hoboken : Taylor and Francis; 2013. p. 197-204.
- Shattuck PT, Narendorf, S. C., Cooper, B., Sterzing, P. R., Wagner, M., & Taylor, J. L. Postsecondary education and employment among youth with an autism spectrum disorder. *Pediatrics*. 2012;129(6):1042-9.
- Shattuck PT, Roux, A., , Hudson, L., Taylor, J., Maenner, M., & Trani, J. Services for Adults With an Autism Spectrum Disorder. *Canadian Journal of Psychiatry*. 2012;57(5):284-91.

- Shattuck PT, & Roux, A.M. Commentary on employment supports research. *Autism: The International Journal of Research & Practice*. 2015;19(2):246-7.
- Sheeran P, Maki A, Montanaro E, Avishai-Yitshak A, Bryan A, Klein WMP, et al. The impact of changing attitudes, norms, and self-efficacy on health-related intentions and behavior: A meta-analysis. *Health Psychology*. 2016;35(11):1178-88.
- Smith K, Webber, L., Graffam, J., & Wilson, C. Employer satisfaction with employees with a disability: Comparisons with other employees. *Journal of Vocational Rehabilitation*. 2004;21(61-69).
- Smith MD, & Coleman, D. Managing the behavior of adults with autism in the job setting. *Journal of Autism and Developmental Disorders*. 1986;16(2):145-54.
- Smith MJ, Ginger EJ, Wright K, Wright MA, Taylor JL, Humm LB, et al. Virtual Reality Job Interview Training in Adults with Autism Spectrum Disorder. *Journal of Autism and Developmental Disorders*. 2014;44(10):2450-63.
- Steiner AM. A Strength-Based Approach to Parent Education for Children With Autism. *Journal of Positive Behavior Interventions*. 2011;13(3):178-90.
- Steiner AM. A Strength-Based Approach to Parent Education for Children With Autism. *Journal of Positive Behavior Interventions*. 2011;13(3):178-90.
- Stone DL, Colella A. A model of factors affecting the treatment of disabled individuals in organizations. *Academy of Management Review*. 1996;21(2):352-401.
- Storey K. A review of research on natural support interventions in the workplace for people with disabilities. *International Journal of Rehabilitation Research*. 2003;26(2):79-84.
- Strickland DC, Coles CD, Southern LB. JobTIPS: A transition to employment program for individuals with autism spectrum disorders. *J Autism Dev Disord*. 2013;43(10):2472-83.
- Stuckl G, Ewert, T., & Cieza, A. Value and application of the ICF in rehabilitation medicine. *Disability and Rehabilitation*. 2002;24(17):932-8.
- Supino PG. Fundamental issues in evaluating the impact of interventions: Sources and control of bias. In: Supino PG, & Borer, J.S., editor. *Constructing and evaluating self-report measures*, in *Principles of research methodology: A guide for clinical investigators*. New York: Springer; 2012. p. 79-110.
- Swanepoel JA, & Harrison, A.W. *The business size distribution in Australia*. Canberra: Department of Industry, Innovation and Science; 2015.
- Tantam D. Psychological disorder in adolescents and adults with Asperger's syndrome. *Autism*. 2000;4(1):47-62.
- Tavassoli T, Miller, L. J., Schoen, S.A., Nielsen, D., & Baron-Cohen, S. Sensory over-responsivity in adults with autism spectrum conditions. *Autism*. 2014;18(4):428-32.
- Taylor J, & Seltzer, M. Employment and post-secondary educational activities for young adults with autism spectrum disorders during the transition to adulthood. *Journal of Autism & Developmental Disorders*. 2011;41(5):566-74.
- Taylor JL, & Seltzer, M. M. Employment and post-secondary educational activities for young adults with autism spectrum disorders during the transition to adulthood. *J Autism Dev Disord*. 2011;41(5):566-74.
- Taylor JL, & Seltzer, M. M. Developing a vocational index for adults with autism spectrum disorders. *J Autism Dev Disord*. 2012;42(12):2669-79.
- Taylor JL, McPheeters, M. L., Sathe, N. A., Dove, D., Veenstra-Vanderweele, J., & Warren, Z. A systematic review of vocational interventions for young adults with autism spectrum disorders. *Pediatrics*. 2012;130(3):531-8.
- Taylor JL. When is a good outcome actually good? *Autism*. 2017:1-2.
- Taylor MC. *Evidence-based practice for occupational therapists*. . 2nd ed. Oxford: Blackwell Publishing Ltd; 2007.
- The Cooperative Research Centre for people living with Autism (Autism CRC). *Autism CRC 2013* [Available from: <http://www.autismcrc.com.au/>].

- The Joanna Briggs Institute. JBI levels of evidence and grades of recommendation Adelaide, Australia: The University of Adelaide; 2014 [Available from: <http://joannabriggs.org/jbi-approach.html>].
- Tourangeau R, Yan T. Sensitive Questions in Surveys. *Psychological Bulletin*. 2007;133(5):859-83.
- Unger D, & Kregel, J. Employers' knowledge and utilization of accommodations. *Work*. 2003;21(1):5-15.
- Unger D. Addressing employer personnel needs and improving employment training, job placement and retention for individuals with disabilities through public-private partnerships. *Journal of Vocational Rehabilitation*. 2007;26(1):39-48.
- Unger DD. Workplace supports: A view from employers who have hired supported employees. *Focus on Autism and Other Developmental Disabilities*. 1999;14(3):167-79.
- Unger DD. Employers' Attitudes Toward Persons with Disabilities in the Workforce: Myths or Realities? *Focus on Autism and Other Developmental Disabilities*. 2002;17(1):2-10.
- United Nations. The Universal Declaration of Human Rights Paris, France: United Nations; 1948 [
- United Nations. Conventions on the rights of persons with disabilities and optional protocol. New York: United Nations; 2006.
- Vogeley K, Kirchner, J. C., Gawronski, A., Tebartz van Elst, L., & Dziobek, I. Toward the development of a supported employment program for individuals with high-functioning autism in Germany. *European Archives of Psychiatry and Clinical Neuroscience*. 2013; 263:197-203.
- Walsh L, Lydon, S., & Healy, O. Employment and Vocational Skills Among Individuals with Autism Spectrum Disorder: Predictors, Impact, and Interventions. *Review Journal of Autism and Developmental Disorders*. 2014;1(4):266-75.
- Walsh N, & Hall, I. The Autism Strategy: implications for people with autism and for service development. *Advances in Mental Health & Intellectual Disabilities*. 2012;6(3):113-20.
- Wanberg CR. The individual experience of unemployment. *Annual Review of Psychology*2012. p. 369-96.
- Wantland DJ, Portillo, C. J., Holzemer, W. L., Slaughter, R., & McGhee, E. M. The effectiveness of web-based vs. non-web-based interventions: A meta-analysis of behavioral change outcomes. *Journal of Medical Internet Research*. 2004;6(4).
- Watts S, & Stenner, P. *Doing Q Methodological Research: Theory, Method and Interpretation*. London: SAGE PublicationsLtd; 2012.
- Wehman P. Workplace inclusion: persons with disabilities and coworkers working together. *Journal of Vocational Rehabilitation*. 2003;18(2):131-41.
- Wehman P, Schall, C., Carr, S., Targett, P., West, M., & Cifu, G. Transition From School to Adulthood for Youth With Autism Spectrum Disorder: What We Know and What We Need to Know. *Journal of Disability Policy Studies*. 2014.
- Wehman P, Lau S, Molinelli A, Brooke V, Thompson K, Moore C, et al. Supported employment for young adults with autism spectrum disorder: Preliminary data. *Research and Practice for Persons with Severe Disabilities*. 2012;37(3):160-9.
- Wehman P, Schall C, McDonough J, Molinelli A, Riehle E, Ham W, et al. Project SEARCH for Youth With Autism Spectrum Disorders: Increasing Competitive Employment On Transition From High School. *Journal of Positive Behavior Interventions*. 2013;15(3):144-55.
- Wehman P, Schall CM, McDonough J, Graham C, Brooke V, Riehle JE, et al. Effects of an employer-based intervention on employment outcomes for youth with significant support needs due to autism. *Autism*. 2016:1-15.

- Wehman PH, Schall, C. M., McDonough, J., Kregel, J., Brooke, V., Molinelli, A., et al. Competitive employment for youth with autism spectrum disorders: Early results from a randomized clinical trial. *Journal of Autism & Developmental Disorders*. 2014;44:487-500.
- Wei X, Wagner, M., Hudson, L., Yu, J. W., & Shattuck, P. Transition to Adulthood: Employment, Education, and Disengagement in Individuals With Autism Spectrum Disorders. *Emerging Adulthood*. 2015;3(1):37-45.
- Wilczynski SM, Trammell B, Clarke LS. Improving employment outcomes among adolescents and adults on the autism spectrum. *Psychology in the Schools*. 2013;50(9):876-87.
- Wood F, G., & Jacobson, S. Educating Supervisors of Employees With Diabetes. *AAOHN Journal*. 2008;56(6):262-7.
- World Health Organization. *International Classification of Functioning, Disability and Health*. Geneva: WHO; 2001.
- World Health Organization. *International Classification of Functioning, Disability and Health: Child and Youth version*. Geneva: WHO; 2007.

Appendices

**Appendix A Curtin University Human Research Ethics
Committee Approval Letter**

Memorandum

To	Professor Torbjorn Falkmer, School of Occupational Therapy and Social Work
From	Professor Peter O'Leary, Chair Human Research Ethics Committee
Subject	Protocol Approval HR 141/2014
Date	15 July 2014
Copy	Dr Sonya Girdler School of Occupational Therapy and Social Work Melissa Scott School of Occupational Therapy and Social Work

Office of Research and Development
Human Research Ethics Committee

TELEPHONE 9266 2784
FACSIMILE 9266 3793
EMAIL hrec@curtin.edu.au

Thank you for providing the additional information for the project titled "*Understanding successful employment for adults with High Functioning Autism/Asperger Syndrome: Development of the Intergrade Employment Success Tool.*". The information you have provided has satisfactorily addressed the queries raised by the Committee. Your application is now **approved**.

- You have ethics clearance to undertake the research as stated in your proposal.
- The approval number for your project is **HR 141/2014**. Please quote this number in any future correspondence.
- Approval of this project is for a period of four years **15-07-2014 to 15-07-2018**.
- Your approval has the following conditions:
 - i) Annual progress reports on the project must be submitted to the Ethics Office.
- **It is your responsibility, as the researcher, to meet the conditions outlined above and to retain the necessary records demonstrating that these have been completed.**

Applicants should note the following:

It is the policy of the HREC to conduct random audits on a percentage of approved projects. These audits may be conducted at any time after the project starts. In cases where the HREC considers that there may be a risk of adverse events, or where participants may be especially vulnerable, the HREC may request the chief investigator to provide an outcomes report, including information on follow-up of participants.

The attached **Progress Report** should be completed and returned to the Secretary, HREC, C/- Office of Research & Development annually.

Our website https://research.curtin.edu.au/guides/ethics/non_low_risk_hrec_forms.cfm contains all other relevant forms including:

- Completion Report (to be completed when a project has ceased)
- Amendment Request (to be completed at any time changes/amendments occur)
- Adverse Event Notification Form (If a serious or unexpected adverse event occurs)

Yours sincerely



Professor Peter O'Leary
Chair Human Research Ethics Committee

Standard conditions of ethics approval

These standard conditions apply to all research approved by the Curtin University Human Research Ethics Committee. It is the responsibility of each researcher named on the application to ensure these conditions are met.

1. **Compliance.** Conduct your research in accordance with the application as it has been approved and keep appropriate records.
 - a. **Monitoring** - Assist the Committee to monitor the conduct of the approved research by completing promptly and returning all project review forms that are sent to you.
 - b. **Annual report** - Submit an annual report on or before the anniversary of the approval.
 - c. **Extensions** - If you are likely to need more time to conduct your research than is already approved, complete a new application six weeks before the current approval expires.
 - d. **Changes to protocol** - Any changes to the protocol are to be approved by the Committee before being implemented.
 - e. **Changes to researcher details** - Advise the Committee of any changes in the contact details of the researchers involved in the approved study.
 - f. **Discontinuation** - You must inform the Committee, giving reasons, if the research is not conducted or is discontinued before the expected completion date.
 - g. **Closure** - Submit a final report when the research is completed. Include details of when data will be destroyed, and how, or if any future use is planned for the data.
 - h. **Candidacy** - If you are a Higher Degree by Research student, data collection must not begin before your Application for Candidacy is approved by your Faculty Graduate Studies Committee.
2. **Adverse events.** Consider what might constitute an adverse event and what actions may be needed if an adverse event occurs. Follow the procedures for reporting and addressing adverse events (<http://research.curtin.edu.au/guides/adverse.cfm>). Where appropriate, provide an adverse events protocol. The following are examples of adverse events:
 - a. Complaints
 - b. Harm to participants. This includes physical, emotional, psychological, economic, legal, social and cultural harm (NS Section 2)
 - c. Loss of data or breaches of data security
 - d. Legal challenges to the research
3. **Data management plan.** Have a Data Management Plan consistent with the University's recordkeeping policy. This will include such things as how the data are to be stored, for how long, and who has authorised access.
4. **Publication.** Where practicable, ensure the results of the research are made available to participants in a way that is timely and clear (NS 1.5). Unless prohibited from doing so by contractual obligations, ensure the results of the research are published in a manner that will allow public scrutiny (NS 1.3, d). Inform the Committee of any constraints on publication.
5. **Police checks and other clearances.** All necessary clearances, such as Working with Children Checks, first aid certificates and vaccination certificates, must be obtained before entering a site to conduct research.
6. **Participant information.** All information for participants must be approved by the HREC before being given to the participants or made available to the public.
 - a. **University logo.** All participant information and consent forms must contain the Curtin University logo and University contact details for the researchers. Private contact details should not be used.
 - b. **Standard statement.** All participant information forms must contain the HREC standard statement.

This study has been approved by the Curtin University Human Research Ethics Committee (Approval Number HR 141/2014). The Committee is comprised of members of the public, academics, lawyers, doctors and pastoral carers. If needed, verification of approval can be obtained either by writing to the Curtin University Human Research Ethics Committee, c/- Office of Research and Development, Curtin University, GPO Box U1987, Perth, 6845 or by telephoning 9266 2784 or by emailing hrec@curtin.edu.au.
 - c. **Plain language.** All participant information must be in plain language that will be easily understood by the participants.

Please direct all communication through the Research Ethics Office

**Appendix B Employment program and intervention studies
linked to the component of the ICF according to target,
modality and outcome of interventions**

SI Table. Employment program and intervention studies linked to the component of the ICF^a according to target, modality and outcome of interventions (*k*=36)

Author	Purpose of the intervention	Target of the intervention		Modality of the intervention	Outcome of the intervention
		Body functions	Activities and Participation	Environmental Factors	
Allen et al., 2010a, USA	To evaluate the use of video modelling (VM) to teach individual with ASD the necessary skills to perform in a WalkAround air-inflated mascot	Second level: b117, b122, b130, b760 Third level: b1300, b1301, b1304, b7600, b7601	Second level: d160, d220, d825 Third level: d2200, d2201, d2202, d2204, d8250, d8251,	Second level: e125, e130 Third level: e1250, e1300	Second level: b122, d825 Third level: d8251
Allen et al., 2010b, USA	To investigate the use of VM for acquisition of selected vocational skills by individuals with ASD, and evaluate the feasibility of individuals with ASD tolerating wearing WalkAround air-inflated costume for short periods of time	Second level: b117, b122, b130, b760 Third level: b1300, b1301, b1304, b7600, b7601, b7602,	Second level: d160, d220, d825, d850 Third level: d2200, d2201, d2202, d2204, d8250, d8251	Second level: e125, e130 Third level: e1250, e1300	Second level: b122, d825 Third level: d8251
Arikawa et al., 2013, Japan	To provide an overview of employment support by an occupational therapist for people with developmental disabilities and the roles they should engaged in and the necessary support they should provide	Second level: b117, b760 Third level: b7600	Second level: d155, d160, d175, d250 d845 Third level: d1550, d1601, d1750, d1751, d2500, d2504, d8451	Second level: e360, e590 Third level: e5900	Second level: d845 Third level: d8451
Baker-Ericzen et al., 2017, USA	To investigate the feasibility, acceptability and initial estimates of outcomes of the Supported Employment Comprehensive Cognitive Enhancement and Social Skills (SUCCESS) program in improving social-cognitive skills in young adults with ASD in a vocational training setting.	Second level: b122, b140, b152, b164 Third level: b1400, b1520, b1521, b1643	Second level: d175, d220, d250, d310, d315, d330, d350, d570, d710, d720, d750, d845 Third level: d1750, d1751, d2200, d2201, d2203, d3150, d3500, d3501, d3502, d3503, d3504, d5708, d7104, d7200, d7202, d7203, d7208, d7509, d8451 Fourth level: d71040, d71041	Second level: e325, e330, e360	Second level: b164, d175, d250, d315, d570, d720, d845 Third level: d3150, d5708, d7203, d8451
Bennett et al., 2010, USA	To examine the effects of covert audio coaching (CAC) on job performance of supported employees in community employment	Second level: b117, b122, b156 Third level: b1560	Second level: d155, d220, d845 Third level: d1550, d1551, d2200, d2201, d2202, d8451	Second level: e130, e360, e590 Third level: e1300, e1301, e5900	Second level: d155, d845 Third level: d1550, d1551, d8451
Bonete et al., 2015, Spain	To test the effectiveness of the Interpersonal Problem-solving for Workplace Adaption Programme for adults with ASD, and evaluate its feasibility	Second level: b117, b122,	Second level: d155, d175, d310, d315, d330, d350, d710, d720 Third level: d1551, d1750, d1751, d3100, d3101, 3102, d3150, d3500, d3501. d3502, d3503, d3504, d7100, d7101, d7102, d7103, d7104, d7106 Fourth level: d71040, d71041	Second level: e325, e360	Second level: b122, d155 Third level: d1550, d1551

SI Table continued

Author	Purpose of the intervention	Target of the intervention		Modality of the intervention	Outcome of the intervention
		Body functions	Activities and Participation	Environmental Factors	
Burke, 2010, USA	To evaluate the efficacy of behavioural skills training and a novel personal digital assistant (PDA)-based performance cue system on individuals' with ASD abilities to perform complex workplace behaviours	Second level: b117, b122, b130, b760 Third level: b1300, b1301, b1304, b7600, b7601, b7602	Second level: d155, d160, d220, d250, d825 Third level: d1550, d1551, d2200, d2201, d2202, d2204, d2501, d2502, d2504, d8250, d8251	Second level: e125, e130 Third level: e1250, e1300	Second level: b122, d155, d825 Third level: d1550, d1551, d8251
Burke et al., 2013, USA	To test computer software that enhances job training and job performance through VM, video prompting and feedback via a computer tablet	Second level: b117, b122, b140 Third level: b1400, b1401, b1402	Second level: d155, d160, d175, d220, d825 Third level: d1550, d1551, d1750, d1751, d2200, d2201, d2202, d8250, d8251	Second level: e125, e130 Third level: e1250, e1300	Second level: d155, d825 Third level: d1550, d1551, d8251
Burt et al., 1991, USA	The effects of a training program for adults with ASD, using a behavioural skills approach to enable employment	Second level: b117, b122,	Second level: d155, d175, d250, d310, d315, d330, d350, d710, d720, d845, Third level: d1550, d1551, d2500, d2501, d2502, d2503, d2504, d3100, d3101, d3102, d3150, d3500, d3501, d3502, d3503, d3504, d7100, d7101, d7102, d7103, d7104, d7106, d7200, d7202, d7203, d7204, d8450, d8451 Fourth level: d71040, d71041	Second level: e330, e360	Second level: d155, d845 Third level: d1550, d1551, d8450, d8451
Dotson et al., 2013, USA	To determine the effectiveness of a group teaching procedure in increasing skill levels of individuals learning a subset of self-employment skills, and to evaluate the effects of extending teaching to the natural environment on performance	Second level: b117, b122	Second level: d155, d175, d220, d250, d310, d315, d330, d350, d825, d845, Third level: d1550, d1551, d1750, d2203, d2501, d2503, d2504, d3100, d3101, d3102, d3150, d3503, d8451	Second level: e325, e360	Second level: b122, d155, d845 Third level: d1550, d1551, d8451
Gentry et al., 2012, USA	Case studies examining individuals with ASD who have been trained to use the Apple iPod Touch PDAs as vocational supports in their workplaces and impact on their functional performance and behaviour	Second level: b140, b164 Third level: b1400, b1641, b1642	Second level: d230, d250, d845 Third level: d2300, d2301, d2305, d2306, d2501, d2503, d2504, d8451	Second level: e125, e130, e360, e590 Third level: e1251, e1301, e5900	Second level: d845 Third level: d2501, d2503, d2504, d8451
Gentry et al., 2015, USA	To determine if the use of an Apple iPod Touch would reduce the need for personal supports in performing job tasks and building on-the-job confidence	Second level: b140, b164, Third level: b1400, b1641, b1642	Second level: d230, d250, d310, d330, d350, d845 Third level: d2300, d2301, d2305, d2306, d2501, d2503, d2504, d8451, d3100, d3101, d3103, d3503, d8451	Second level: e125, e130, e360, e590 Third level: e1251, e1301, e5900	Second level: d845 Third level: d2501, d2503, d2504, d8451

SI Table. Continued

Author	Purpose of the intervention	Target of the intervention		Modality of the intervention	Outcome of the intervention
		Body functions	Activities and Participation	Environmental Factors	
Gilson and Carter, 2016, USA	A pilot study examining the effect of a CAC job coaching package including audio cuing, social-focused coaching and reducing the proximity of job coaches	Second level: b122, b156, b164 Third level: b1560, b1641	Second level: d220, d350, d710, d840 Third level: d2200, d2201, d3504, d7103, d7104 Fourth level: d71040, d71041	Second level: e125, e130, e360 Third level: e1251, e1301	Second level: d840 Third level: d7103, d7104 Fourth level: d71040, 71041
Ham, 2014, USA	To describe successful employment for two individuals with ASD taking part in Project SEARCH	Second level: b164 Third level: b1641, b1642	Second level: d250, d845 Third level: d2501, d2502, d2503, d2504, d8451	Second level: e325, e330, e360	Second level: d845 Third level: d8451
Hayes et al., 2015, USA	To evaluate the efficacy of mobile device delivering peer and self-modelling/promoting support for job interviews across industries	Second level: b117, b122, b140 Third level: b1400, b1401	Second level: d155, d220, d310, d315, d330, d350, d710, d825, d845 Third level: d1558, d2209, d3100, d3101, d3102, d3150, d3508, d7108,	Second level: e125, e130 Third level: e1251, e1301	Second level: d155 Third level: d1558
Hill et al., 2013, USA	To investigate the use of the iPad as an employment support tool in increasing independence and success for individuals with ASD in a program that provided employment support	Second level: b122, b140, b164 Third level: b1400, b1401, b1641, b1642	Second level: d250, d710, d845 Third level: d2501, d2503, d2504, d7108, d8451	Second level: e125, e130, e360 Third level: e1251, e1301	Second level: d845 Third level: d8451
Hillier, 2007, USA	To evaluate the effect of a 2-year vocational support program on employment rates and participant income, and explore the factors impacting job satisfaction, social integration and employers' evaluations of job performance for individuals with ASD	Second level: b117	Second level: d220, d250, d310, d330, d350, d710, d720, d845 Third level: d2204, d2503, d2504, d3100, d3101, d3102, d3508, d7203 d8450, d8451	Second level: e360	Second level: d845 Third level: d8451
Kellems and Morningstar, 2012, USA	To evaluate the effectiveness of using VM delivered through an Apple iPod for teaching job-related tasks to individuals with ASD	Second level: b122, b140, b164 Third level: b1400, b1641	Second level: d155, d160, d220, d845 Third level: d1558, d1608, d2200, d8451	Second level: e130 Third level: e1308	Second level: b122, d155, d845 Third level: d1508, 8451
Lattimore, 2006, USA	To compare the effects of job-site training supplemented with simulation training to job-site training alone in the acquisition of job skills for individuals with ASD	Second level: b117, b122	Second level: d155, d220, d845, d859 Third level: d1558, d2200, d8450	Second level: e360, e585, e590 Third level: e5850, e5900	Second level: b122, d155, d845 Third level: d1508, d8450
Lattimore, 2008, USA	To explore simulation training of supported work skills before adults with ASD received on-the-job skills training and evaluate simulation training materials that are different to the actual job site	Second level: b117, b122,	Second level: d155, d220, d845, d859 Third level: d1558, d2200, d8450	Second level: e360, e585, e590 Third level: e5850, e5900	Second level: b122, d155, d845 Third level: d1508, d8450

SI Table. Continued

Author	Purpose of the intervention	Target of the intervention		Modality of the intervention	Outcome of the intervention
		Body functions	Activities and Participation	Environmental Factors	
Liu et al., 2013, Hong Kong	To explore the effectiveness of a workplace training programme targeted at enhancing work-related behaviours in individuals with ASD and intellectual disabilities	Second level: b117, b122, b152, Third level: b1521	Second level: d155, d220, d310, d315, d330, d335, d349, d350, d710, d720 Third level: d2200, d3102, d3150, d3500, d3504, d3350, d7104, d7108, d7202 Fourth level: d71041	Second level: e398, e590 Third level: e5900	Second level: d155, d349 Third level: d7108
Lynas, 2014, UK	To prepare individuals with ASD for employment using a customised employment approach to develop and improve their employability skills	Second level: b117, b122	Second level: d155, d470, d720, d840, d845, d860 Third level: d1558, d4709, d7203, d8450, d8451	Second level: e360, e590 Third level: e5900	Second level: b122, d840, d845 Third level: d1558, d8450, d8451
McLaren et al., 2017, Lebanon	To evaluate the use of an Individual Placement Support (IPS) model in assisting young adults with ASD to obtain and maintain competitive employment.	Second level: b117, b122, b140, b152 Third level: b1400	Second level: d570, d750, d760, d845 Third level: d5708, d7508, d7600, d8450, d8451	Second level: e360, e590 Third level: e5900	Second level: b152, d570, d750, d760, d845 Third level: d5708, d7508, d7600, d8451
Mawhood and Howlin, 1999, UK	To explore the outcomes of 2-year supported employment project for individuals with high functioning ASD	Second level: b117, b122	Second level: d720, d840, d845 Third level: d7203, d8450, d8451	Second level: e325, e330, e360, e590 Third level: e5900	Second level: d845 Third level: d8450, d8451
Morgan et al., 2014, USA	To evaluate the efficacy of an interview skills curriculum delivered in a group format for individuals with ASD in improving their social-pragmatic skills required for a job interview	Second level: b117, b122	Second level: d310, d315, d330, d335, d350, d599, d845 Third level: d3500, d3501, d3502, d3503, d3504, d3102, d3150, d3350, d8450	Second level: e325, e360	Second level: d845 Third level: d8451
Rausa et al., 2016, AUS	To examine the effectiveness of VM in teaching job-related telephone skills to individuals with ASD	Second level: b117, b122, b140 Third level: b1400	Second level: d155, d210, d310, d330, d350, d360, d845 Third level: d1558, d3600, d2105, d3102, d3503, d8451	Second level: e130 Third level: e1308	Second level: b122, d155, d845 Third level: 1558, d8451
Rosen et al., 2017, Israel	To evaluate the usability of <i>Ready, Set, Work!</i> , a job readiness video modelling application for adolescents with and without ASD	Second level: b117, b122, b140 Third level: b1400	Second level: d175, d310, d330, d350, d710, d740, d825 Third level: d3500, d3501, d3502, d3503, d7100, d7103, d7108, d7400	Second level: e125, e130, e360 Third level: e1250, e1300	Second level: d710, d825 Third level: d7100, d7103, d7108
Schall, 2010, USA	To describe the positive behaviour support model implement in community workplace to adapt socially appropriate behaviour for individuals with ASD	Second level: b122, b164, Third level: b1641	Second level: d335, d349, d845 Third level: d3551, d8450, d8451	Second level: e325, e330, e360	Second level: d845 Third level: d8451
Smith and Coleman, 1986, USA	To facilitate the adjustment of individuals with ASD in the workplace through behaviour management practices	Second level: b117, b122,	Second level: d330, d349, d710, d845 Third level: d7108, d8451	Second level: e360	Second level: d710, d845 Third level: d7108, d8451

SI Table. Continued

Author	Purpose of the intervention	Target of the intervention		Modality of the intervention	Outcome of the intervention
		Body functions	Activities and Participation	Environmental Factors	
Smith et al., 2014, USA	To evaluate the effectiveness of virtual reality job interview training in improving job interview skills and enhancing self-confidence in individuals with ASD	Second level: b117, b122, b140 Third level: b1400, b1402	Second level: d155, d220, d310, d330, d350, d360, d720, d845 Third level: d1558, d2200, d3102, d3108, d3503, d3608, d7200, d8450	Second level: e125, e130, e360 Third level: e1251, e1301	Second level: b122, d155, d845 Third level: d1508, d8450
Strickland et al., 2013, USA	To evaluate the effectiveness of an internet accessed training program in teaching job interview skills using theory of mind, video models, visual supports and virtual reality training for individuals with high functioning ASD	Second level: b117, b122, b140 Third level: b1400	Second level: d155, d220, d250, d310, d315, d330, d335, d350, d360 d720, d845 Third level: d1558, d2200, d2501, d2502, d2503, d3100, d3102, d3150, d3350, d3503, d3608, d7203, d8450	Second level: e125, e130, e360 Third level: e1251, e1301	Second level: b122, d155 Third level: d1508
Walsh et al., 2018, Ireland	To evaluate the effectiveness of the Adolescent Curriculum for Communication and Effective Social Skills (ACCESS) program and video modelling in increasing the social communication skills required for workplace inclusion for adults with ASD	Second level: b117, b122, b140 Third level: b1400	Second level: d210, d230, d240, d330, d350, d570, d710, d720, d750, d835 Third level: d2108, d2308, d2400, d2401, d3500, d3501, d3503, d3504, d5708, d7102, d7103, d7202, d7500	Second level: e125, e130, e360 Third level: e1250, e1300	Second level: d330, d350, d710, d720, d825 Third level: d3500, d3501, d3503, d3504, d7102, d7103, d7202
Wehman et al., 2012, USA	To examine the effects of supported employment in finding and maintaining competitive employment for individuals with ASD	Second level: b117, b122,	Second level: d132, d720 d845 Third level: d7203, d8450, d8451	Second level: e135, e360, e590 Third level: e1358, e5900	Second level: d845 Third level: d8450, d8451
Wehman et al., 2013, USA	To describe the components of Project Search and its adaptation for individuals with ASD including behavioural supports, structure, social and visual supports and role-playing	Second level: b122, b164, Third level: b1641, b1642,	Second level: d155, d250, d310, d315, d330, d349, d350, d710, d720, d840, d845 Third level: d1558, d2502, d3100, d3102, d3150, d3508, d7203, d8450, d8451	Second level: e135, e330, e360 Third level: e1358	Second level: d845 Third level: d8450, d8451
Wehman, 2014, USA	To examine the preliminary results of the effectiveness of a securing employment for individuals with ASD taking part in the Project Search employment program	Second level: b122, b164, Third level: b1641, b1642	Second level: d155, d220, d250, d310, d315, d330, d349, d350, d710, d720, d840, d845 Third level: d1558, d2208, d2502, d3100, d3102, d3150, d3508, d7203, d8450, d8451	Second level: e135, e330, e360 Third level: e1358	Second level: d220, d845 Third level: d2208, d8450, d8451
Wehman et al., 2016b, USA	To examine the effectiveness of obtaining job skills and securing employment for individuals with ASD taking part in the Project Search employment program	Second level: b122, b164, Third level: b1641, b1642	Second level: d155, d220, d250, d310, d315, d330, d349, d350, d710, d720, d840, d845 Third level: d1558, d2502, d3100, d3102, d3150, d3508, d7203, d8450, d8451	Second level: e135, e330, e360 Third level: e1358	Second level: d845 Third level: d8450, d8451

Note: ^aICF categories within the table can be found in ICF-CY version as developed by the World Health Organization (2007).

VM: Video modelling; ASD: Autism spectrum disorder; CAC: covert audio coaching; PDA: Personal Digital Assistant

Appendix C Published manuscript: The costs and benefits of employing an adult with Autism Spectrum Disorder: A systematic review-Paper VIII

This research identified the need to review literature relating to the costs and benefits of employing adults on the autism spectrum as a possible environmental factor impacting employment. Therefore, a systematic review was conducted as part of an Honours project that linked to this thesis project.

The systematic review manuscript was accepted for publication on 18 September 2015, and has been published as:

Jacob, A., Scott, M., Falkmer, M., & Falkmer, T. The costs and benefits of employing an adult with Autism Spectrum Disorder: A systematic review. PLOS One, 10(10); e0139896. doi:10.1371/journal.pone.0139896

This publication was written by Andrew Jacob, an Honours student supervised by Melissa Scott, Marita Falkmer and Torbjörn Falkmer. The systematic review provides background to the work that was done in developing the IEST™. This manuscript was submitted for the award of an Honours degree for Andrew Jacob. Therefore, the reference of the publication has been included in the thesis for contextual information only and not for examination.

The manuscript is presented in PDF format and formatted as per the guidelines for PLOS One.

RESEARCH ARTICLE

The Costs and Benefits of Employing an Adult with Autism Spectrum Disorder: A Systematic Review

Andrew Jacob¹✉, Melissa Scott^{1,2}✉, Marita Falkmer^{1,2,3}✉, Torbjörn Falkmer^{1,2,4}✉*

1 School of Occupational Therapy & Social Work, Curtin University, Perth, Western Australia, Australia, **2** Cooperative Research Centre for Living with Autism (Autism CRC), Long Pocket, Brisbane, Queensland, Australia, **3** School of Education and Communication, CHILD programme, Institute of Disability Research, Jönköping University, Jönköping, Sweden, **4** Rehabilitation Medicine, Department of Medicine and Health Science (IMH), Faculty of Health Sciences, Linköping University, Linköping, Sweden

✉ These authors contributed equally to this work.

* T.Falkmer@curtin.edu.au



click for updates

OPEN ACCESS

Citation: Jacob A, Scott M, Falkmer M, Falkmer T (2015) The Costs and Benefits of Employing an Adult with Autism Spectrum Disorder: A Systematic Review. PLOS ONE 10(10): e0139896. doi:10.1371/journal.pone.0139896

Editor: Nouchine Hadjikhani, Harvard Medical School, UNITED STATES

Received: January 12, 2015

Accepted: September 18, 2015

Published: October 7, 2015

Copyright: © 2015 Jacob et al. This is an open access article distributed under the terms of the [Creative Commons Attribution License](https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Data Availability Statement: All articles included in this study are cited in the References. All data in this study are available in a public repository, i.e., the data used in this systematic review was obtained through a thorough literature review using databases such as: CINAHL Plus, Cochrane Library, Emerald, Ovid Medline, ProQuest, PsycINFO, Scopus and Web of Science. These databases are internationally used and can be accessed by anyone from the public should they chose to search for the data from this systematic review.

Funding: This research was supported by funding from Australian Postgraduate award scholarship to

Abstract

Background

Despite an ambition from adults with Autism Spectrum Disorder (ASD) to be employed, there are limited opportunities for competitive employment for this group. Employment is not only an entitlement enjoyed by others in society, but employing adults with ASD also has economic benefits by decreasing lost productivity and resource costs for this group. Few studies have explored the cost-benefit ratio for employing adults with ASD and even fewer have taken the viewpoint of the employer, particularly applying this situation to ASD. Until such study occurs, employers may continue to be reluctant to employ adults from this group.

Objective

This review aimed to examine the costs, benefits and the cost-benefit ratio of employing adults with ASD, from a societal perspective and from the perspective of employers.

Methods

Eight databases were searched for scientific studies within defined inclusion criteria. These databases included CINAHL Plus, Cochrane Library, Emerald, Ovid Medline, ProQuest, PsycINFO, Scopus and Web of Science.

Results and Conclusion

Enhancing the opportunities for adults with ASD to join the workforce is beneficial from a societal perspective, not only from an inclusiveness viewpoint, but also from a strict economic standpoint. Providing supported employment services for adults with ASD does not only cut the cost compared with providing standard care, it also results in better outcomes for adults with ASD. Despite the fact that ASD was the most expensive group to provide

Melissa Scott from the Australian Federal Government and Curtin University. The candidate acknowledges the financial support of the Cooperative Research Centre for Living with Autism Spectrum Disorder (Autism CRC), established and supported under the Australian Government Cooperative Research Centre Program. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Competing Interests: The authors have declared that no competing interests exist.

vocational rehabilitation services for, adults with ASD have a strong chance of becoming employed once appropriate measures are in place. Hence, rehabilitation services could be considered as a worthwhile investment. The current systematic review uncovered the fact that very few studies have examined the benefits, the costs and the cost-benefit ratio of employing an adult with ASD from the perspective of employers indicating a need for this topic to be further explored.

Introduction

Autism Spectrum Disorder (ASD) is a lifelong condition that represents individuals who experience similar characteristics that affect their behaviour patterns [1]. The term ASD traditionally includes the diagnoses of Autistic disorder, Asperger syndrome (AS), Childhood Disintegrative Disorder, Rett Syndrome and Pervasive Developmental Disorder Not Otherwise Specified (PDD NOS) [2]. In the two major diagnostic manuals, DSM-IV and ICD-10 [2, 3] ASD is defined by impairments in three domains; social reciprocity, communication and behaviour and interests [2]. Diagnosis requires reduced functionality across all, or at least two of the three domains. ASD comprises heterogenic phenotypes and hence, the severity of symptoms within each domain can differ greatly between individuals [4]. For example, individuals diagnosed as having AS are expected to have developed typically in regard to early language development and cognitive abilities [2] and the term high functioning Autism Spectrum Disorder (HFA) is commonly used when referring to individuals with ASD with a mean IQ score within or above the normative average range [5]. For the purpose of this article, the term ASD will be used throughout to represent adults with HFA/AS, who do not have an intellectual disability.

Despite the fact that most adults would have been diagnosed according to DSM-IV, it is worth noting that in the new diagnostic manual DSM-5, the separate diagnoses mentioned above are merged into one single category, ASD [6]. The diagnostic criteria in the DSM-5 focus on the severity of limitations in the core domains, i.e., social communication, social interaction, restricted interests and repetitive behaviours, and do not define specific diagnostic groups. Furthermore, DSM-5 recognises that sensory differences are common in ASD and hence, unusual sensory behaviours are now included in the domain of stereotyped motor and verbal behaviour [6].

Difficulties in Theory of mind, which comprise the ability to assess one self's and other's intentions, actions and behaviours, have been used in order to explain some manifestations in ASD [7–10]. Social communication for example, requires the ability to identify intention in others, ven individuals diagnosed with AS may have difficulties that affect their social communication style and ability to interpret non-verbal and spoken language [11]. It is common that individuals with ASD experience difficulties in the area of executive functions, i.e., in cognitive processes, such as working memory, planning, initiating and monitoring actions, impulse control, and mental flexibility [8, 12, 13]. Furthermore, individuals with ASD have been purported to have a perceptual processing style biased towards attending to detail as a result of a weak central coherence [14, 15]. A detailed processing of stimuli may explain the perceptual sensitivity [16, 17] and together with difficulties in executive functioning, may result in commonly experienced difficulties in generalisation, high reliance on routines and sameness [16].

The number of individuals being diagnosed with ASD in the United States (US) has been increasing annually at 10–17% [18]. In Australia, the prevalence of Autism is estimated at 24.2

to 47.2 for every 10,000 people and the prevalence of AS at 12.7 to 15.3 for every 10,000 people with an overall figure of 36.9 to 62.5 per 10,000 [19]. The increase in the prevalence of ASD has, to a large part, been explained by a change in diagnostic criteria, a greater awareness of the characteristics associated with ASD in clinicians and improved possibilities to diagnose ASD in young children [20, 21]. However, it has also been suggested that the fact that eligibility for services and support is often based on a categorical diagnosis in western countries may have contributed to the increased prevalence, since it may result in a tendency to diagnose children despite insufficient symptoms in order to fulfil all required criteria of ASD [22]. Nonetheless, with the existing prevalence statistics, there are approximately 153,000 adults with ASD in Australia of working age (16–64 years) [23].

Becoming and remaining employed in a competitive job market can be challenging for any individual, yet can be especially complex for adults with ASD because of the social interaction and communication needs in the workplace [18]. However, to date, most research in ASD focuses on early intervention for children with ASD, while only a limited amount exists for adults and adolescents with ASD as they transition into the workforce [18]. Competitive employment (henceforth employment and employed in the current study refer to competitive employment if not otherwise specified), is one of the key ambitions for most people after their education is completed, this is also true for adults with ASD [18]. Despite a need and ambition of individuals with ASD to become employed, there are limited opportunities for competitive employment [18]. This may be attributed to interactional difficulties experienced by adults with ASD, impacting on their ability to find and maintain employment. Difficulties in social interaction and communication in the workplace impact on job performance such as: effectively interacting with supervisors and co-workers, understanding and interpreting social rules, difficulty working independently and resistance to workplace change [24, 25]. As result of these interactional difficulties, the jobs of adults with ASD are often terminated prematurely [26]. The consequences of unemployment remain an important issue as work provides an opportunity to improve quality of life in adults with ASD and encourages personal dignity, as well as increased cognitive performance [18]. Alternatively, unemployment often contributes negatively to an individual's quality of life by increasing social isolation and creating a lack of cognitive and mental stimulation [18].

The characteristics of ASD, in particular social and communication difficulties, may present challenges to individuals in the workplace that may require managers and co-workers to develop previously unused skills. These skills may include; overcoming communication difficulties between themselves and employees/colleagues with ASD, considering the need for possible supervision, and providing clarity to these individuals around social rules in the workplace. Employers and co-workers also need to consider possible subdued or exaggerated responses to sensory stimulation from adults with ASD, as well as allowing time for adjustment for change within the workplace [27].

Nevertheless, as mentioned, the desire and ability to become employed and build a meaningful life exists for adults with ASD. Therefore, thoughtful consideration needs to be given to their unique capabilities and characteristics. This includes; considering each adult's strengths, challenges and personal interests, which ultimately can lead to appropriate job-matching for employment. Effective job-matching between the person and their environment, when combined with the use of proper supports [28], allows an adult with ASD to be productive and valuable to their employers, ultimately maintaining their ongoing employment [18]. Additionally, the management practices of the employer, including a willingness to supply necessary accommodations and flexibility, have been shown to be important for the success of adults with ASD, in the workplace [28]. Employers who foster an atmosphere of mutual support and

a worker-friendly environment that benefits both the worker with ASD and the employer create a more inclusive workplace and ultimately a more inclusive community [28].

The number of working age adults with ASD in Australia is expected to increase over the next 10 years to 181,000 [23]. Due to this rapidly increasing number of individuals with ASD now graduating from high school, there is a growing need and increasing attention from educational researchers to understand what supports and what hinders employment outcomes for students with disabilities [18]. Not only is access to employment an entitlement enjoyed by other groups in society that enhances their quality of life and dignity, but employment also allows an adult to receive wages that can be put towards supporting themselves and building their own future [18]. Employment can also create a sense of purpose, meaning, independence and identity for an individual, from which adults with ASD could benefit and thrive. In addition employing adults with ASD has economic benefits for both employers and governments.

Even for adults who have received a postsecondary education, becoming employed remains problematic [18] as it is believed that 50–75% of adults with ASD are unemployed [29–31]. This is unfortunate, as the wages from employment allow adults with ASD to be financially self-reliant, decreasing reliance on government payments [32]. Hence, employing individuals with ASD may decrease the cost of community supports, such as adult care and day time activities. Additionally, overlooking the potentially valuable contribution of employees with ASD results in lost productivity, which has been approximated to cost Australia between AUD\$ 939–1,357 million per annum [19]. Hence, the societal financial impact of adults with ASD without employment may actually harm the economy [10]. However, the advantages employers receive from employing adults with ASD are yet to be examined and identified [18]. Benefits can include; reliability, lower levels of absenteeism, trustworthiness, attention to detail, a high degree of accuracy in visual tasks, advantageous long-term memory and concentration ability [18]. This is in addition to productivity benefits, including the greater work ethic and better focus that individuals with ASD apply to roles and jobs that might be repetitive in nature or are isolated from others and which other workers may be reluctant to perform [18].

The amount of research that considers employment of individuals with ASD from the perspective of employers is minimal. The research is particularly limited in understanding the question “is hiring an adult with ASD financially cost effective for an employer?” Previously, studies have explored the financial costs and benefits of supported or competitive employment from the viewpoint of the worker, taxpayer, government and society, but no study exists that explores the cost-benefit ratio from the viewpoint of the employer in relation to employees with ASD [33]. This gap in the research may contribute to employers’ concerns about having to pay for extensive work training, continual supervision and other expensive accommodations when they employ an adult with ASD [33]. Additionally, there is no current evidence available that identifies if there is a worthwhile financial cost-benefit ratio to the employer’s business from hiring an adult with ASD in terms of productivity. Until these relevant and valid concerns from employers are addressed, there is a potential for employers to show reluctance in employing adults with ASD [33]. Hence, the aim for the current systematic review was to examine the costs, benefits and the cost-benefit ratio of employing adults with ASD, from a societal perspective and from the perspective of employers.

Methods

Eight databases were filtered for scientific studies within the set inclusion criteria. These databases included CINAHL Plus, Cochrane library, Emerald, Ovid Medline, ProQuest, PsycINFO, Scopus and Web of Science. The key terms were refined with truncation expansion with assistance from librarian staff and included: autism*, ASD, ASC, aspergers*, “high functioning”,

employ*, hiring*, job*, occupat*, activity*, cost*, benefit*, economic*, cost effectiveness, "cost benefit", analysis. When using Boolean operators the following combined search strategy used in review was `autis* OR ASD OR ASC OR aspergers* OR "high functioning" AND employ* OR hiring* OR job* occupat* OR activity* AND cost* OR benefit* OR economic*`. A screening for relevant titles and abstracts was completed. After this, a full text review of remaining articles was initiated and a manual search was completed to select articles from reference lists of collected articles.

Inclusion/Exclusion Criteria

Articles that specifically mentioned ASD were included in the results. This review accepted articles that focused on the different types of ASD including: ASD, AS and HFA. These articles were kept if they were from 1994 onwards due to the creation of the DSM-IV [1]. Further inclusion criteria included articles that described adults aged 18 years and over. A linguistic limit was applied for articles to be included only if published in English. The hierarchy of evidence was used as a guide in determining the level of evidence for articles [34]. This systematic review included all forms of peer reviewed articles. Textbooks and similar grey literature were excluded.

Studies were included if they focused on competitive employment for adults with ASD including casual employment, i.e., the employee is only being paid for the time actually worked and does not receive payment for public holidays personal/carer's leave or annual leave, part time competitive employment, full time competitive employment and supported employment. Supported employment in this review includes employment obtained through programs that support a person with disability with the process of finding and retaining a job in the open job market.

Outcomes were grouped according to costs of employing adults with ASD, benefits of employing adults with ASD and cost-benefits of employing an adult with ASD. Exclusion criteria included: children with ASD and participants in studies with significant comorbidities. After consideration of 10 randomly selected journal abstracts by two reviewers using the pre-selected inclusion and exclusion criteria, 100% agreement was found. Issues concerning eligibility for the articles were resolved with discussion and a mutual agreement settled upon.

Methodological Quality

The full text articles were assessed for quality using the Kmet checklist (S2 Table) [35]. The Kmet checklist has a 14 point list with scoring criteria. Scores were represented as percentages with the strength of the evidence being categorised as, strong (> 80%), good (70–80%), adequate (50–70%) or limited (<50%). The assessment of the included studies using the Kmet Form was completed independently by two of the authors who reached a consensus on all articles. The scores and description of methodological quality are displayed in S1 Table.

Data Extraction

The Cochrane Handbook for Systematic Reviews Section 7.3 was used as a guide to create a data extraction form (S3 Table) [36]. The data extraction form included citation, publication status, database, level of evidence, study design, population, methods, and outcomes grouped according to costs of employing adults with ASD, benefits of employing adults with ASD and cost-benefits of employing an adult with ASD and results and conclusions from the studies.

Data Synthesis and Analysis

The analysis and synthesis of the themes included: the cost effectiveness of employing an adult with ASD to governments, the cost effectiveness of employing adults with ASD to society and the cost effectiveness of employing these adults with ASD to employers. To discuss the themes from the review a narrative approach was applied.

Results

After searching electronic databases, 2,597 titles were found. After filtering of the titles and abstracts, 2,511 were excluded leaving 86 articles. Duplicates articles (56) were removed as well as five grey literature articles. The remaining 25 articles were then retrieved in full. Fourteen articles were excluded after full paper review as they did not fulfil the inclusion criteria, leaving 11 articles. The reference lists of these articles were then manually examined for suitable studies, with none being identified. The Kmet Form was then used to rate the remaining 11 articles to determine their methodological quality. This process is displayed in [Fig 1](#).

The 11 articles that met the inclusion criteria had a total number of 67,251 participants included. There were also two studies that used information from national databases rather than using participants [37, 38]. The study designs of the included articles were four cohort studies [37, 39–41], three case control studies [42–44], three descriptive studies [32, 38, 45] and one correlational study [46]. Of these included studies, four described the costs to governments for employing these adults with ASD [32, 41, 43, 44] and four explored the costs to society when employing adults with ASD [37, 38, 40, 45]. The remaining three studies explored the cost-benefits to the employer of adult/s with ASD [39, 42, 46].

Quality Assessment of Studies

The methodological quality of studies assessed with the Kmet Form, ranged from adequate to strong, as described in [S2 Table](#). Eight of the included studies were identified as strong [38–43, 45, 46]. The remaining three were rated as adequate according to the Kmet [32, 37, 44].

Järbrink, McCrone (32) used interviews with subjects' relatives to obtain information regarding costs. The study was limited to four communities in Sweden and made no mention of the confounding factors in the study. The study used a limited sample of 19 participants limiting transferability. In the study of Mavranzouli, Megnin-Viggars (44) limitations existed in the area of random allocation of the participants and in this study there was no mention of controlling for confounding factors. In the study by Ganz (37) the methodology was not well suited as it used a prevalence-base cohort or hypothetical cohort to describe the costs of employing an adult with ASD, which limits the ' general application of the findings.

Intervention

The intervention was employment for adults with ASD. Casual, part time, full time competitive employment and supported employment were all included. Employment was considered using a cost-benefit analysis, in order to predict the cost and benefits of employing adults with ASD for the employer. It also predicted the cash flow during a set period. These costs include dollars spent, as well as indirect dollars allocated on other areas to achieve change.

Findings

Costs to governments. A total of four studies explored the cost of ASD to the government. The study by Howlin, Alcock (41) explored a group of participants diagnosed with ASD who had been involved in a supported employment program. This study assessed the outcome from

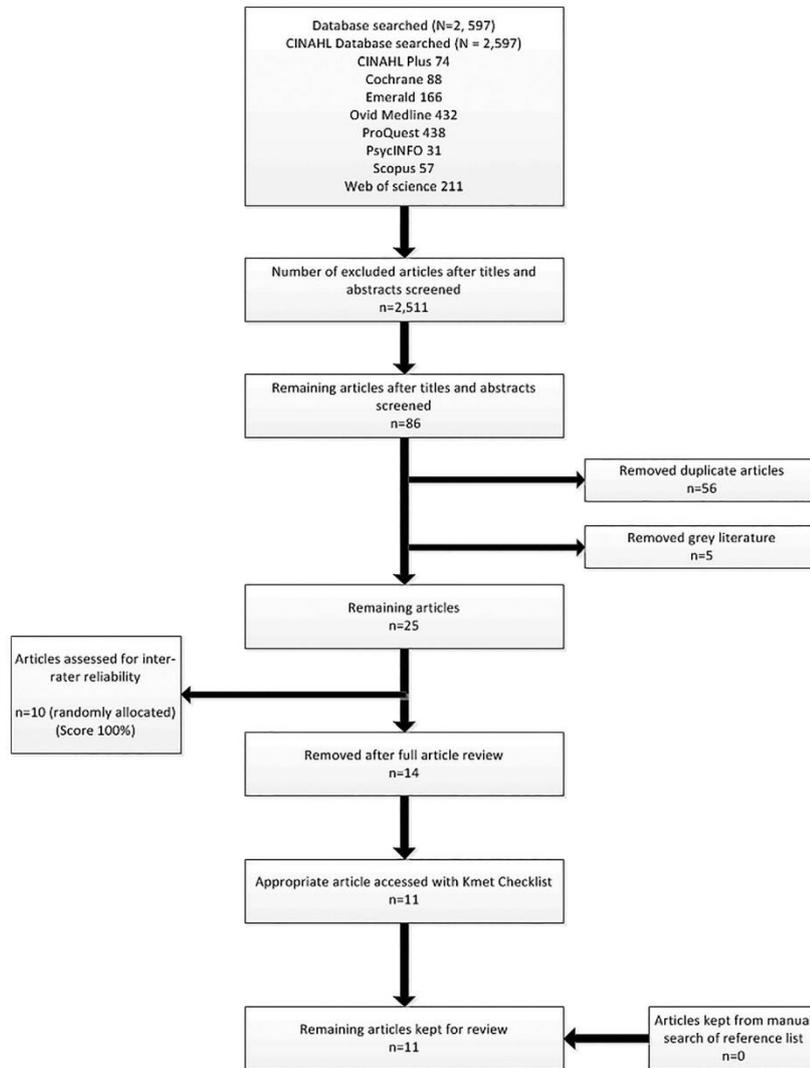


Fig 1. Flow Diagram for Selection of Studies

doi:10.1371/journal.pone.0139896.g001

supported employment over an eight-year period. The results from this study showed that the overall savings to the Exchequer over an eight-year period were in total £179,095 for the 114 jobs in the program, which can be seen in relation to a reduction in benefits and national insurance and increased tax contribution. A significant decrease in the number of benefits received was also observed once these participants were employed (median pre-work = £2907, range £0–£9193; median post-work = £0, range £0–£6801; median reduction = –£1974, range +£1440 to –£9030; Wilcoxon $Z = -7.72$; $p < 0.001$). The results of this study demonstrate that employing individuals with ASD can save government costs, through reducing the number of benefits people with ASD require when unemployed.

Between 2000 and 2003 a study was conducted in four communities in western Sweden [32]. The study aimed to improve authorities' understanding of people with ASD and their need for employment. Results from this study found the average annual community support cost for each young adult with ASD was €7154. It was also found that employment support accounted for 4.0% of the total annual cost, while community support represented 22.6% of total annual cost (€596 per month per participant). The daily activities costs accounted for 20.9% of the baseline total service cost or €310 per person per month. The employment services cost represented 2.6% of the total cost for these participants, while the average annual informal care cost was approximated at €1554 and expenses at €1052. Informal care costs represented 8.2% of total costs. These results show that if more individuals were employed, it would reduce the amount spent on daily activities and carers for the government.

Cimera, Wehman (43) conducted a study of people with ASD who attended sheltered workshops before entering supported employment programs, to determine if they had better outcomes than those who did not receive sheltered employment services. This study found no differences between these groups for employment rates. Adults previously in sheltered workshops received lower wages (US\$129.36 compared to US\$191.42 per week), and were more expensive to serve (US\$6,065.08 compared to US\$2,440.60), compared with the group who had not been in sheltered workshops prior to supported employment. This study concluded that individuals with ASD had better vocational outcomes if they did not enrol in sheltered workshops before entering supported employment. This showed that vocational rehabilitation costs for individuals with ASD in sheltered employment prior to participating in supported employment were greater when compared to adults with ASD who only participated in supported employment.

The cost-effectiveness in the United Kingdom (UK) of supported employment versus day services for adults with ASD was again supported by Mavranezouli, Megnin-Viggars (44). They demonstrated that adults with ASD in supported employment had better outcomes in comparison to standard care for adults with ASD. Providing supported employment only added an extra cost of £5,600 per quality-adjusted life year or £18 per additional week in employment. These findings agree with those of Cimera et al. [43] supporting that there can be a financial gain for the government to provide supported employment services.

Cost to society. A total of four studies explored the cost of ASD to society [15,16,18,23]. An estimation of the economic significance of ASD in the UK, found that the mean annual costs (including lost employment, but excluding benefits), for an adult with ASD and an additional intellectual impairment living in family households was £36,507, in supported accommodation £87,662, in residential care £88,937 and in long term hospital care £97,863 [38]. This research also determined that for adults with ASD without an intellectual disability living in a family household, the annual cost was £32,681, a major element being the cost of lost productivity for society and tax revenue for the Exchequer and lost employment for the adult with ASD. The aggregate national UK cost was £25 billion. The cost of supporting adults with an intellectual impairment (including lost employment) represents two-thirds of these costs (£17

billion). Publicly funded services accounted for 59% of this total, with lost employment for the adult with ASD (36%) and family expenses (5%) accounting for the remainder. This research also reported that amongst individuals with ASD without an intellectual disability, this group has an annual cost of £32,681 of which the greatest part was attributed to lost employment and lost productivity, when they could alternatively be employed and contributing a valuable return to society and tax revenue.

The employment outcomes and service costs for adults with ASD was examined by a study of the US vocational rehabilitation system during the period of 2002–2006 [40]. It found that during 2002, the cost of providing vocational rehabilitation services to an individual with ASD was US\$3,282 per person. In 2006 this decreased to US\$2,992 per person. This was in comparison to the costs of providing the same services to the overall vocational rehabilitation population, which conversely increased from US\$2,263 to US\$2,336 during the same time period. The research also noted that in relation to wages earned by people with ASD, during 2002 this group cost the vocational rehabilitation US\$26.74 for every dollar these individuals earned in wages. In 2006 this ratio decreased to US\$19.19. The wider vocational rehabilitation population had cost-wage ratios of US\$12.01 and US\$9.73 during the same period. In relation to costs per hours worked, comparable cost trends were found. When the cost per wages earned was compared, ASD was more costly to serve than the other conditions included in the study, such as traumatic brain injury, mental illness and learning disabilities. It was also reported that the employment rate for individuals with ASD was 40.85%. The only other areas of disabilities that experienced higher rates of employment were people with learning disabilities (41.8%) and sensory impairments (57.2%). This shows that while ASD was one of the most expensive groups to put through vocational rehabilitation services, it was more efficient for adults with ASD, rather than being unemployed, compounding an already significant cost. This study also indicates that individuals with ASD have a strong chance of becoming employed once they have appropriate supports, thereby having worthwhile investment potential for vocational rehabilitation services.

Järbrink and Knapp (45) explored the implications of the cost of ASD to the UK. After assuming 5 per 10,000 people experience ASD, they estimated annual UK societal costs were more than £1 billion. The individual with ASDs' lifetime cost was greater than £2.4 million. The major costs were living support and day activities. Costs for families represented 2.3% of the total cost of ASD to the UK. The lifetime cost of placing an adult with ASD in sheltered work was £16,200, 0.6% of the total cost ASD. The total lifetime cost of placing an adult with ASD in sheltered employment was 8.6% of the total cost. This highlights the significant lifetime cost (£67,800) for society to place an individual who has ASD in a sheltered workplace, when alternatively employing these individuals who have specific skills and abilities, would save UK taxpayers £67,800 per individual with ASD over a lifetime.

Ganz (37) explored consequences for society for overlooking employing adults with ASD. Using a hypothetical ASD cohort, the study aimed to define both costs over a lifetime of ASD and age specific costs in US. The findings from this study were that lifetime societal cost of ASD amounted to US\$3.2 million per capita. It was also found that lost productivity and adult care were the largest contributors of these costs. Therefore, employing adults with ASD would significantly reduce the lifetime cost of ASD in terms of lost productivity. In addition, employing individuals with ASD would decrease the reliance on adult care or daily activities, ultimately significantly reducing these costs to society.

Employer benefits. A total of three studies explored the costs of employing an adult with ASD. Schaller and Yang (46), examined whether people with ASD receiving competitive employment services were statistically significantly diverse compared to individuals with ASD receiving supported employment services. This was completed in relation to successful closure

rates for their vocational rehabilitation cases, hours worked per week, earnings per week and average case service cost. The average hours worked competitively per week by participants was 27.19 (SD = 11.36), and the average hours worked for the supported employment participants was 22.21 (SD = 10.33), which showed a significant difference between the groups ($t = 5.31$; $p < .001$). They also found that the mean cost of services for competitive employment participants was US\$3,341 (SD = US\$5,744.); while the supported employment participants was US\$6,883 (SD = US\$9,497), which was a significant difference ($t = 6.65$; $p < .001$) [46]. This study identified information on important factors that are involved in a cost-benefit ratio in terms of weekly average hours worked by the group in competitive employment (27.19). The results demonstrate that individuals with ASD can continuously contribute at a worksite for a significant period of time.

Cimera and Burgess (42) aimed to understand if working in the community was cost-efficient from the perspective of an employee with ASD. They found that not only working in the community was cost effective from the perspective of the employee with ASD, but also that their hours worked per week were consistent during 2002–2007 (mean hours = 23.7/week). This study showed that adults with ASD not only receive benefits from working competitively, but can provide benefits to the employer, specifically by maintaining consistent hours worked per week for significant periods of time.

Burgess and Cimera (39) evaluated the employment outcomes for adults with ASD, who had used vocational rehabilitation providers during 2002–2011. The findings were that during this period the amount of hours worked per week (22–26) by individuals with ASD was consistent across the states of the US. It was reported that the number of adults using vocational rehabilitation services had increased during the past 10 years from a low of 913 individuals representing 0.86% of the total amount of people receiving vocational rehabilitation services in 2002 to 8,154 which accounts for 5.43% of the group in 2011. These findings demonstrate two points; that again, there is information that adults with ASD can contribute to a workplace for a significant number of hours per week over an extended period across a country, as well showing that an increasing number of adults with ASD are using vocational rehabilitation services seeking employment, demonstrating a desire and a willingness to work and contribute, which would interest employers who are looking for reliable employees who want to really contribute to their business.

Discussion

Several consistent points from the current knowledge base emerged. It is clear that there was a significant decrease in the number of benefits governments had to pay to adults with ASD once they were employed [47, 48]. The total lifetime cost of placing an adult with ASD in sheltered employment was 8.6% of the total cost [45]. This again highlights the increase of lifetime cost to society if interventions focus on placing individual with ASD in a sheltered workplace instead of interventions aimed at open or supported employment for adults with ASD. These results strongly indicate that governments can make savings by supporting employment services for adults with ASD. These services do not only reduce the cost for governments compared with providing standard care, they will also result in better outcomes for adults with ASD.

Unemployment and underemployment of adults with ASD may also be considered as an expensive overlooked opportunity, since it results in lost productivity and a demand for services providing adult care [37]. Hence, providing employment opportunities for adults with ASD enables this group to contribute valuable services to the society, while reducing costs for daily activities [32]. Considering the estimated annual societal cost for adult care and daily

activities in the UK was more £1 billion, the results from the current review showed that by initially spending money on supporting individuals with ASD to get into employment, governments can save significant costs through increased productivity, reduced amount of benefits, and less required funding for daily activities and community supports. Furthermore, despite the fact that ASD was the most expensive group to provide vocational rehabilitation services for, it appears that adults with ASD have a strong chance of becoming employed once appropriate measures are in place. As a consequence, rehabilitation services could also be considered as a worthwhile investment [40].

The current systematic review only found a few studies that explored the economic benefits of employing individuals with ASD for employers specifically. Three studies found similar results regarding the number of hours per week adults with ASD were able to work consistently over a period of years. These studies showed that adults with ASD can, on average, contribute 23.30 hours per week. Although this information is relevant to employers as they may be more likely to employ individuals that they consider reliable and will be able to work for a consistent period, more studies are needed, in order to provide employers with information that may enhance their inclination to employ individuals with ASD. The fact that there is a potential to greatly reduce societal costs, as of yet it is probably not a strong enough incentive for individual employers to employ adults with ASD.

It could be concluded that enhancing the opportunities for adults with ASD to join the workforce is beneficial from a societal perspective, not only from an inclusiveness viewpoint, but also from a strict economic standpoint. However, the current systematic review uncovered the fact that very few studies have examined the benefits, the costs and the cost-benefit ratio of employing an adult with ASD from the perspective of employers. It is obvious that there is a significant need for this topic to be further explored from the perspective of employers. Increased knowledge about costs and benefits of employing adults with ASD may show employers that the benefits of employing adult with ASD outweigh the cost. Furthermore, additional research into benefits for employers, including the greater work ethic and better focus that individuals with ASD may apply to roles and jobs is warranted.

The results of this study are relevant to occupational therapy practice for adults with ASD and can be best explained through The Triangle of Health and Wellbeing developed by Wilcock (49) which recognizes that a key contributor to well-being and health for humans is occupational participation. This framework defines *doing* as the act of working towards meeting basic human needs to improve health and well-being. Having this internal motivator to engage in *doing* with others for a shared purpose provides a sense of belonging and purpose [49]. It is this *doing* and *belonging* that leads to improving and growing a persons' well-being and their health. Occupational therapy focuses on providing ways for individuals with ASD to engage in their meaningful activities, such as employment (*doing*). However, by providing the opportunities for these adults to become employed, occupational therapists need to be confident that employers are equipped to manage this working relationship, so that it can be mutually beneficial. Further research that explores not only the employers' perspective but also the perspective of employees with ASD could inform therapists to support employers in create a work environment that enables adults with ASD to work at their full capacity. Furthermore, it may create awareness that employment of adults with ASD is important and potentially essential to certain companies.

The fact that so few studies were available is a limitation of the current systematic review. In total, only three countries are represented, i.e., U.K, USA and Sweden. Although these countries are relatively equal in relation to GDP per capita (2014 the World Bank reported that in US \$ GDP/ capita was; 45,603 in U.K, 54,630 in USA and 58,887 in Sweden), the labour markets and service systems differ. Furthermore, the studies were conducted between the years 2005–

2014. Consequently, some findings may be outdated due to changes related to employment and service provision in the three countries. Hence, a true cross national comparison of cost and benefits was not possible due to lack of data. The results of the current review should therefore be interpreted with due caution and may only apply to countries with similar economic structures. However, it can be concluded that in each of these countries employing adults with ASD in competitive employment was economically beneficial on a societal level. Furthermore, it may be concluded that by creating competitive employment opportunities for individuals with ASD, the social capital of a society is probably strengthened. Social capital is the network of relationships among people living and working within a particular society, enabling that society to function effectively and in cohesion [50].

Conclusion

It could be concluded that enhancing the opportunities for adults with ASD to join the workforce is beneficial from a societal perspective, not only from an inclusiveness viewpoint, but also from a strict economic standpoint. Governments can ultimately make savings by spending money on providing supported employment services for adults with ASD. These services do not only cut the cost for governments compared with providing standard care, they will also result in better outcomes for adults with ASD. Furthermore, despite the fact that adults with ASD are the most expensive group to provide vocational rehabilitation services for, it appears that they have a strong chance of becoming employed once appropriate measures are in place, indicating that rehabilitation services could be considered as a worthwhile investment [40]. However, the current systematic review uncovered the fact that very few studies have examined the benefits, the costs and the cost-benefit ratio of employing an adult with ASD from the perspective of employers. Furthermore, existing service system and governmental subsidiaries could be expected to significantly impact an employers' inclination to employ adults with ASD. However, these systems vary between the nations represented in the included articles. Based on the current review it is therefore not possible to make a conclusion about costs and benefits of employing an adult with ASD from the perspective of employers. It is obvious that there is a significant need for this topic to be further explored from this perspective.

Supporting Information

S1 Table. The Cost Effectiveness of Employing Adults with ASD to Governments, Society and Employers. The Level number under design refers to the level of evidence for articles where; level I = A systematic review of level II studies or large multicentre trial, level II = A randomised controlled trial, level III = A quasi-experimental study, cohort or case control, level IV = A pre-experimental, pre-test post-test, correlational studies of multiple sites, level V = Single site correlational studies, descriptive studies, qualitative studies, expert opinion [12]. (DOCX)

S2 Table. The Kmet Checklist. This list was used to access the scientific quality of the included articles. (DOCX)

S3 Table. The data extraction form. The form is based on The Cochrane Handbook for Systematic Reviews Section 7.3. It comprise the headings and the outcomes variables used as a guide for data extraction. (DOCX)

Acknowledgments

The authors acknowledge the financial support of the Cooperative Research Centre for Living with Autism Spectrum Disorders (Autism CRC), established and supported under the Australian Government's Cooperative Research Centres Program.

Author Contributions

Conceived and designed the experiments: ATJ MS MF TF. Performed the experiments: ATJ MS MF TF. Analyzed the data: ATJ MS MF TF. Contributed reagents/materials/analysis tools: ATJ MS MF TF. Wrote the paper: ATJ MS MF TF.

References

1. APA. Diagnostic and Statistical Manual of Mental Disorders. 4th Edition, Text Revision (DSM -IV-TR) ed. Washington, DC: American Psychiatric Publishing; 2000.
2. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, Text Revision (DSM-IV-TR). Washington, DC: American Psychiatric Publishing; 2000.
3. WHO. International Classification of Impairments, Disabilities and Health. Geneva: World Health Organisation 1980.
4. Johnson CP, Myers SM, Council on Children With Disabilities. Identification and Evaluation of Children With Autism Spectrum Disorders. *Pediatrics*. 2007; 120(5):1183–215. doi: [10.1542/peds.2007-2361](https://doi.org/10.1542/peds.2007-2361) PMID: [17967920](https://pubmed.ncbi.nlm.nih.gov/17967920/)
5. Volker MA. Introduction to the Special Issue: High-Functioning Autism Spectrum Disorders in the Schools. *Psychology in the Schools*. 2012; 49(10):911–6. doi: [10.1002/pits.21653](https://doi.org/10.1002/pits.21653)
6. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders 5ed. Washington, DC: American Psychiatric Association; 2013.
7. Baron-Cohen S. Theory of mind and autism: A review. *International Review of Research in Mental Retardation*. 2000; 23:169–84.
8. Hill EL, Frith U. Understanding autism: insights from mind and brain. *Philosophical Transactions of the Royal Society of London Series B: Biological Sciences*. 2003; 358(1430):281–9. PMID: [12639326](https://pubmed.ncbi.nlm.nih.gov/12639326/)
9. Tager-Flusberg H. Evaluating the Theory-of-Mind Hypothesis of Autism. *Current Directions in Psychological Science*. 2007; 16(6):311–5. doi: [10.1111/j.1467-8721.2007.00527.x](https://doi.org/10.1111/j.1467-8721.2007.00527.x)
10. Wellman HM, Cross D, Watson J. Meta-Analysis of Theory-of-Mind Development: The Truth about False Belief. *Child Development*. 2001; 72(3):655–84. doi: [10.1111/1467-8624.00304](https://doi.org/10.1111/1467-8624.00304) PMID: [11405571](https://pubmed.ncbi.nlm.nih.gov/11405571/)
11. Jordan R. Managing autism and Asperger's syndrome in current educational provision. *Pediatric Rehabilitation*. 2005; 8(2):104–12. PMID: [16089250](https://pubmed.ncbi.nlm.nih.gov/16089250/)
12. Elliott R. Executive functions and their disorders. *British Medical Bulletin*. 2003; 65(1):49–59. doi: [10.1093/bmb/65.1.49](https://doi.org/10.1093/bmb/65.1.49)
13. Funahashi S. Neuronal mechanisms of executive control by the prefrontal cortex. *Neuroscience Research*. 2001; 39(2):147–65. doi: [10.1016/s0168-0102\(00\)00224-8](https://doi.org/10.1016/s0168-0102(00)00224-8) PMID: [11223461](https://pubmed.ncbi.nlm.nih.gov/11223461/)
14. Bölte S, Holtmann M, Poustka F, Scheurich A, Schmidt L. Gestalt Perception and Local-Global Processing in High-Functioning Autism. *Journal of Autism and Developmental Disorders*. 2007; 37(8):1493–504. doi: [10.1007/s10803-006-0231-x](https://doi.org/10.1007/s10803-006-0231-x) PMID: [17029017](https://pubmed.ncbi.nlm.nih.gov/17029017/)
15. Rajendran G, Mitchell P. Cognitive theories of autism. *Developmental Review*. 2007; 27(2):224–60. doi: [10.1016/j.dr.2007.02.001](https://doi.org/10.1016/j.dr.2007.02.001)
16. Happé F, Frith U. The Weak Coherence Account: Detail-focused Cognitive Style in Autism Spectrum Disorders. *Journal of Autism and Developmental Disorders*. 2006; 36(1):5–25. doi: [10.1007/s10803-005-0039-0](https://doi.org/10.1007/s10803-005-0039-0) PMID: [16450045](https://pubmed.ncbi.nlm.nih.gov/16450045/)
17. Kern JK, Trivedi MH, Garver CR, Grannemann BD, Andrews AA, Savla JS, et al. The pattern of sensory processing abnormalities in autism. *Autism*. 2006; 10(5):480–94. doi: [10.1177/1362361306066564](https://doi.org/10.1177/1362361306066564) PMID: [16940314](https://pubmed.ncbi.nlm.nih.gov/16940314/)
18. Hendricks D. Employment and adults with autism spectrum disorders: Challenges and strategies for success. *Journal of Vocational Rehabilitation*. 2010; 32(2):125–34. doi: [10.3233/jvr-2010-0502](https://doi.org/10.3233/jvr-2010-0502)
19. Synergies Economic Consulting. Economic costs of ASD in Australia 2007. Available from: https://aeiou.org.au/files/Cost%20of%20autism%20report_FINAL_120507.pdf.

20. Hansen SN, Schendel DE, Pamer ET. Explaining the increase in the prevalence of autism spectrum disorders: The proportion attributable to changes in reporting practices. *JAMA pediatrics*. 2015; 169(1):56–62. doi: [10.1001/jamapediatrics.2014.1893](https://doi.org/10.1001/jamapediatrics.2014.1893) PMID: [25365033](https://pubmed.ncbi.nlm.nih.gov/25365033/)
21. Matson JL, Kozlowski AM. The increasing prevalence of autism spectrum disorders. *Research in Autism Spectrum Disorders*. 2011; 5(1):418–25. <http://dx.doi.org/10.1016/j.rasd.2010.06.004>.
22. Leonard H, Dixon G, Whitehouse AJO, Bourke J, Aiberti K, Nassar N, et al. Unpacking the complex nature of the autism epidemic. *Research in Autism Spectrum Disorders*. 2010; 4(4):548–54. <http://dx.doi.org/10.1016/j.rasd.2010.01.003>.
23. ABS. *Survey of disability, ageing and carers* No. (4430.0). 2010. Available from: <http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4430.0Main+Features12009>.
24. Hendricks D. Employment and adults with autism spectrum disorders: Challenges and strategies for success. 2010. doi: [10.3233/jvr-2010-0502](https://doi.org/10.3233/jvr-2010-0502)
25. Hillier A, Campbell H, Mastriani K, Izzo MV, Kool-Tucker AK, Lea Cherry. Two-Year Evaluation of a Vocational Support Program for Adults on the Autism Spectrum. *Career Development for Exceptional Individuals*. 2007; 30(1):125–34.
26. Mawhood L, Howlin P. The Outcome of a Supported Employment Scheme for High-Functioning Adults with Autism or Asperger Syndrome. *Autism*. 1999; 3(3):229–54. doi: [10.1177/1362361399003003003](https://doi.org/10.1177/1362361399003003003)
27. Hillier A, Campbell H, Mastriani K, Margo Vreeburg I, et al. Two-year evaluation of a vocational support program for adults on the autism spectrum. *Career Development for Exceptional Individuals*. 2007; 30(1):35–47. PMID: [223124689](https://pubmed.ncbi.nlm.nih.gov/223124689/).
28. Hagner D, Cooney BF. "I Do That for Everybody": Supervising Employees With Autism. *Focus on Autism and Other Developmental Disabilities*. 2005; 20(2):91–7. PMID: [205062593](https://pubmed.ncbi.nlm.nih.gov/205062593/).
29. Howlin P. Outcome in Adult Life for more Able Individuals with Autism or Asperger Syndrome. *Autism*. 2000; 4(1):63–83. doi: [10.1177/1362361300004001005](https://doi.org/10.1177/1362361300004001005)
30. Hurlbutt K, Chalmers L. Adults with autism speak out perceptions of their life experiences. *Focus on Autism and Other Developmental Disabilities*. 2002; 17(2):103–11.
31. Mawhood L, Howlin P, Rutter M. Autism and developmental receptive language disorder—A comparative follow-up in early adult life. I: Cognitive and language outcomes. *Journal of Child Psychology and Psychiatry*. 2000; 41(5):547–59. PMID: [10946748](https://pubmed.ncbi.nlm.nih.gov/10946748/)
32. Järbrink K, McCrone P, Fombonne E, Zanden H, Knapp M. Cost-impact of young adults with high-functioning autistic spectrum disorder. *Res Dev Disabil*. 2007; 28(1):94–104. <http://dx.doi.org/10.1016/j.ridd.2005.11.002>. 2007-01317-010. PMID: [16551499](https://pubmed.ncbi.nlm.nih.gov/16551499/)
33. Cimera RE. The monetary benefits and costs of hiring supported employees: A pilot study. *Journal of Vocational Rehabilitation*. 2009; 30(2):111–9. doi: [10.3233/JVR-2009-0457](https://doi.org/10.3233/JVR-2009-0457)
34. Kielhofner G. *Research in Occupational Therapy: Methods of Inquiry for Enhancing Practice*. Philadelphia, PA: F. A. Davis Company; 2006.
35. Kmet LM, Lee RC, Cook LS. *Standard quality assessment criteria for evaluating primary research papers from a variety of fields*. Alberta, Canada: Alberta heritage Foundation for Medical Research; 2004.
36. Higgins JPT, Green S. *Cochrane handbook for systematic reviews of interventions* 2011.
37. Ganz ML. The lifetime distribution of the incremental societal costs of autism. *Archives of Pediatrics & Adolescent Medicine*. 2007; 161(4):343–9. PMID: [17404130](https://pubmed.ncbi.nlm.nih.gov/17404130/).
38. Knapp M, Romeo R, Beecham J. Economic cost of autism in the UK. *Autism*. 2009; 13(3):317–36. doi: [10.1177/1362361309104246](https://doi.org/10.1177/1362361309104246) PMID: [19369391](https://pubmed.ncbi.nlm.nih.gov/19369391/)
39. Burgess S, Cimera RE. Employment outcomes of transition-aged adults with autism spectrum disorders: a state of the States report. *American Journal on Intellectual & Developmental Disabilities*. 2014; 119(1):64–83. doi: [10.1352/1944-7558-119.1.64](https://doi.org/10.1352/1944-7558-119.1.64) PMID: [2012455608](https://pubmed.ncbi.nlm.nih.gov/2012455608/). Language: English. Entry Date: 20140411. Revision Date: 20140411. Publication Type: journal article.
40. Cimera RE, Cowan RJ. The costs of services and employment outcomes achieved by adults with autism in the United States. *Autism: The International Journal of Research & Practice*. 2009; 13(3):285–302. doi: [10.1177/1362361309103791](https://doi.org/10.1177/1362361309103791) PMID: [2010275802](https://pubmed.ncbi.nlm.nih.gov/2010275802/). Language: English. Entry Date: 20090626. Revision Date: 20110520. Publication Type: journal article.
41. Howlin P, Alcock J, Burkin C. An 8 year follow-up of a specialist supported employment service for high-ability adults with autism or Asperger syndrome. *Autism: The International Journal of Research & Practice*. 2005; 9(5):533–49. PMID: [16287704](https://pubmed.ncbi.nlm.nih.gov/16287704/). Language: English. Entry Date: 20060224. Revision Date: 20091218. Publication Type: journal article.
42. Cimera RE, Burgess S. Do adults with autism benefit monetarily from working in their communities? *Journal of Vocational Rehabilitation*. 2011; 34(3):173–80. doi: [10.3233/JVR-2011-0545](https://doi.org/10.3233/JVR-2011-0545) PMID: [205062593](https://pubmed.ncbi.nlm.nih.gov/205062593/)

- [2011037097](#). Language: English. Entry Date: 20110617. Revision Date: 20120817. Publication Type: journal article.
43. Cimera RE, Wehman P, West M, Burgess S. Do sheltered workshops enhance employment outcomes for adults with autism spectrum disorder? *Autism*. 2012; 16(1):87–94. <http://dx.doi.org/10.1177/1362361311408129>. PMID: 21610189. doi: [10.1177/1362361311408129](https://doi.org/10.1177/1362361311408129)
 44. Mavranzouli I, Megnin-Viggars O, Cheema N, Howlin P, Baron-Cohen S, Pilling S. The cost-effectiveness of supported employment for adults with autism in the United Kingdom. *Autism*. 2013;0(0):1–10. doi: [10.1177/1362361313505720](https://doi.org/10.1177/1362361313505720)
 45. Järbrink K, Knapp M. The economic impact of autism in Britain. *Autism*. 2001; 5(1):7–22. <http://dx.doi.org/10.1177/1362361301005001002>. 2001-00742-001. PMID: 11708392
 46. Schaller J, Yang NK. Competitive employment for people with autism: correlates of successful closure in competitive and supported employment. *Rehabilitation Counseling Bulletin*. 2005; 49(1):4–16. PMID: 2009051405. Language: English. Entry Date: 20051125. Revision Date: 20091218. Publication Type: journal article.
 47. Howlin P, Alcock J, Burkin C. An 8 year follow-up of a specialist supported employment service for high-ability adults with autism or Asperger syndrome. *Autism*. 2005; 9(5):533–49. PMID: [16287704](https://pubmed.ncbi.nlm.nih.gov/16287704/)
 48. Mavranzouli I, Megnin-Viggars O, Cheema N, Howlin P, Baron-Cohen S, Pilling S. The cost-effectiveness of supported employment for adults with autism in the United Kingdom. *Autism*. 2013;1362361313505720. doi: [10.1177/1362361313505720](https://doi.org/10.1177/1362361313505720) PMID: [24126866](https://pubmed.ncbi.nlm.nih.gov/24126866/)
 49. Wilcock A. *Health: An Occupational Perspective, An occupational perspective of health*. NJ: Slack Inc: Thorofare; 1998.
 50. ABS. *Australian social trends* No. (4102.0) 2008. Available from: <http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4102.0Chapter4102008>.

**Appendix D The benefits and costs to employers of employing
an adult with on the autism spectrum survey**

The benefits and costs to employers of employing an adult on the autism spectrum survey

Dear Employer,

We need your help to understand the benefits and costs of employing an adult with autism. This survey will make an important contribution to assist current and future employment of individuals with autism in the workplace, as well as providing constructive information for prospective employers.

If you have any questions or would like more information, please contact one of the following researchers:

- Andrew Jacob- Email: andrew.t.jacob@student.curtin.edu.au or
Mobile: 0439 855 904
- Melissa Scott- Email: melissa.scott@curtin.edu.au or Work Phone: 08 9266 5164
- Torbjörn Falkmer- Email: T.Falkmer@curtin.edu.au or Work Phone: 08 9266 9051

Thank you for your time and consideration.

Consent Form

Consent to Participate:

- I agree to participate in the study outlined to me
- I have been informed of and understand the purpose of the study
- I have had the opportunity to ask questions and they have been answered
- I understand that there are no known risks involved in the study
- I understand that participation is voluntary and that I can withdraw at any time without reason or consequence
- I have been informed that all personal information will be kept confidential and any identifiable information will not be used in published material
- I agree that the information I provide can be used in other studies and/or publications

Do you consent to participate in this study?

Yes

No, thank you

Signature: _____

Name: _____

Date: _____

Instructions

The questions in this survey relate to your employee(s) with autism spectrum disorders including high functioning autism, Asperger's syndrome, any individual self-identifying as having autism. The information you provide will help improve employment practices and policies in regard to the employment of adults with autism.

The questions ask you to give answers on a specific employee with autism in your organisation (Employee A), as well as on two specific employees without autism who are matched on the basis of similar jobs (Employee B, Employee C).

If this matching process is not possible, due to jobs not being similar, matching on a basis of similar responsibilities, role or qualifications as close as possible is acceptable. If that is not possible, please fill in as much as you can about the employee with autism (Employee A). Should you wish to inform employees that you are participating in this survey, you are encouraged to do so.

Section 1: Experience employing an adult with Autism

The purpose of this section is to collect information about your experience of being an employer of a specific adult with autism in your workplace (Employee A).

1.1. How many employees with autism does your organisation currently employ?

- 1
- 2
- 3
- 4
- 5
- 6+
- I am not sure

1.2. The employee with autism was employed because: (Multiple selections allowed)

- The individual was previously known to the employer
 - The employer was contacted by an agency
 - The employee with autism approached the employer directly for a job
 - This employee with autism was considered to be the best candidate in a job interview
 - The organisation's policy of corporate social responsibility
 - A family inquiry was made directly to the employer
 - Other reasons (Please specify)
-
- I am not sure

1.3. How would you describe the interactions between the employee with autism and fellow employees?

- Friendly mixed exchanges of both work and out of work conversations
- Solely worked related conversations between workers
- Restricted to greetings between workers
- The employee struggles with interaction with other workers
- The employee only interacts with a few of the other workers
- Not Applicable

1.4. How has having this employee with autism in your employment impacted your workplace?

(Multiple options allowed)

- Improvement of workplace morale
- Increased awareness regarding people with autism in the workplace
- Positive adaption in workplace culture to include and make the employee with autism feel part of the team
- New creative and different skills have been brought to the workplace
- The lack of autism specific knowledge often leads to miscommunication between colleagues
- Need for continuous workplace supervision of this employee has increased workload for other staff

- Lack of autism specific staff training has resulted in an increase in workplace conflict between colleagues
 - Decreased productivity by team
 - Other (Please specify)
-
- Not Applicable

1.5. Would you recommend employing an employee with autism to a business associate?

- Yes (Go to question 1.6.)
- No
- Possibly

If “possibly”, what other considerations does your decision depend on?

If “no”, what considerations influenced this decision?

1.6. Have other employees with autism been previously employed here?

- Yes
- No
- I am not sure

1.7. If the employee with autism (Employee A) left the workplace, whom would you consider hiring?

- Similar worker with autism
- Worker without autism
- Would not be replace
- I am not sure

These questions ask you to give answers on both an employee with autism in your organisation (Employee A), as well as two matching employees without autism who have similar jobs (Employee B, Employee C). If this is not possible, due to jobs not being similar, matching on a basis of similar responsibilities, role or qualifications as close as possible is acceptable. If that is not possible, please fill in as much as you can about Employee A.

1.8 How would you describe this employee's flexibility in the workplace on job tasks?

	Above Standard	Meets Standard	Below Standard
Employee A (autism)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Employee B	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Employee C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1.9 How would you describe the employee's attention to detail?

	Above Standard	Meets Standard	Below Standard
Employee A (autism)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Employee B	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Employee C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1.10 How often does this employee complete their allocated amount of work on time?

	Above Standard	Meets Standard	Below Standard
Employee A (autism)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Employee B	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Employee C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1.11 How would you best describe this employee's ability to follow instructions?

	Above Standard	Meets Standard	Below Standard
Employee A (autism)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Employee B	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Employee C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1.12 How do you feel about leaving this employee to interact with customers?

	Not Applicable	Completely independent	Interacts with customers, but supervisors are present	Requires some active supervision when dealing with customers	Not confident leaving them alone with customers
Employee A (autism)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Employee B	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Employee C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1.13 This employee's work ethic is best described as:

	Above Standard	Meets Standard	Below Standard
Employee A (autism)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Employee B	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Employee C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1.14 Select the description that best describes the productivity of this employee:

	Above Standard	Meets Standard	Below Standard
Employee A (autism)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Employee B	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Employee C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1.15 Select the description that best describes the typical quality of work done by this employee:

	Above Standard	Meets Standard	Below Standard
Employee A (autism)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Employee B	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Employee C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Thank you, we really appreciate your insight.

Section 2: Employer information

The purpose of this section is to collect background information about the workplace.

2.1. What is your role in the workplace?

- Business owner
 - Manager
 - Supervisor
 - Other (Please specify)
-

2.2. Which industry best describes the main function of the organisation?

- Accommodation and Food Services
 - Agriculture, Forestry and Fishing
 - Arts and Recreation Services
 - Construction
 - Education and Training
 - Electricity, Gas, Water and Waste Services
 - Financial and Insurance Services
 - Information Media and Telecommunications
 - Health Care and Social Assistance
 - Mining
 - Professional, Scientific and Technical Services
 - Public Administration and Safety
 - Rental, Hiring and Real Estate Services
 - Retail Trade
 - Transport, Postal and Warehousing
 - Wholesale Trade
 - Other (Please specify)
-

- I am not sure

2.3. Which of the following best describes the main client base of the organisation?

- Local Community
 - Statewide
 - Nationwide
 - International
 - Other (Please specify)
-

2.4. What is the approximate total number of employees in the organisation?

	0-5	6-10	11-20	20-100	100+
Full-time	<input type="checkbox"/>				
Part-time	<input type="checkbox"/>				
Casual	<input type="checkbox"/>				

2.5. Which of the following describe the approximate annual revenue of the business?

- Under \$100,000
- \$100,001-\$500,000
- \$500,001-\$1 million
- \$100,001 million-\$500 million
- \$500,001 million-\$1 billion
- More than \$1 billion
- I do not know

2.6. For how many years have you been employing employees with autism?

- Less than 1 year
- 1-2 years
- 2-3 years
- 4-8 years
- 9-12 years
- 13-16 years
- 17-20 years
- More than 20 years
- I do not know

2.7. Was the employee with autism recruited through a disability employment services provider?

- Yes
- No
- I do not know

Thank you, we really appreciate your insight.

Section 3: Work conditions

The purpose of this section is to collect information about the employment conditions for the three employees.

3.1. What is this employee's job description/title and key tasks (please list 3-5 key tasks)?

Job Title	Key tasks
Employee A (autism):	1. 2. 3. 4. 5.
Employee B:	1. 2. 3. 4. 5.
Employee C:	1. 2. 3. 4. 5.

3.2. Approximately how long has this employee been employed at your organisation?

	< 6 months	6-12 months	13-18 months	19-24 months	25-30 months	31-36 months	> 36 months
Employee A (autism)	<input type="checkbox"/>						
Employee B	<input type="checkbox"/>						
Employee C	<input type="checkbox"/>						

3.3. On what basis is this employee employed?

	Full-time	Part-time	Casual	Contract	Trial/ Probation
Employee A (autism)	<input type="checkbox"/>				
Employee B	<input type="checkbox"/>				
Employee C	<input type="checkbox"/>				

3.4. Do you use financial assistance (government assistance/funded programs) when paying wages for this employee with autism?

- Yes
 No (Go to question 3.5.)

If "yes", which financial assistance scheme do you use?

- Supported Wage System
 Wage Subsidy Scheme
 Other (Please specify)

3.5. What percentage of the employee with autism wage is paid through the wage subsidy scheme?

	1-5%	6-10%	11-20%	21-40%	41-60%	61-70%	71-90%	I do not know
Employee A (autism)	<input type="checkbox"/>							

3.6. Please specify to whom the chosen three employees report:

	Supervisor	Manager	Peer	Business owner	Other
Employee A (autism)	<input type="checkbox"/>				
Employee B	<input type="checkbox"/>				
Employee C	<input type="checkbox"/>				

3.7 What is the average hours worked by the employee per week (excluding overtime)?

	<10	11-15	16-20	21-25	26-30	31-35	>35	I do not know
Employee A (autism)	<input type="checkbox"/>							
Employee B	<input type="checkbox"/>							
Employee C	<input type="checkbox"/>							

3.8. What is the employee's approximate hourly rate of pay?

	\$1-5	\$6-10	\$11-20	\$21-30	\$31-40	\$41-50	\$51-60	\$61+	I do not know
Employee A (autism)	<input type="checkbox"/>								
Employee B	<input type="checkbox"/>								
Employee C	<input type="checkbox"/>								

3.9. What is the average overtime hours worked by employee per week (Overtime is work performed outside the ordinary hours listed in an award or agreement)?

	0	1-5	6-10	11-15	16-20+	I do not know
Employee A (autism)	<input type="checkbox"/>					
Employee B	<input type="checkbox"/>					
Employee C	<input type="checkbox"/>					

3.10. What is the employee's approximate hourly rate of overtime pay?

	\$10-30	\$31-50	\$51-70	\$71-90	\$91-100	\$110	I do not know
Employee A (autism)	<input type="checkbox"/>						
Employee B	<input type="checkbox"/>						
Employee C	<input type="checkbox"/>						

3.11. Was there any additional training /staff development required for this worker once they started work?

	Yes	No	I do not know
Employee A (autism)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Employee B	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Employee C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3.12. What type of additional training/staff development was required? (Multiple options allowed)

	Customer Service	Role specific skill re-enforcement/enhancement	Computer training	Conflict resolution	Behaviour management	Safety procedures	Sales strategies	Other
Employee A (autism)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Employee B	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Employee C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3.13. What type of "other" additional training/staff development was required?

3.14. Approximately how many hours of additional training/staff development has been required?

	0	1-3	4-6	7-9	10-13	14-16	16+
Employee A (autism)	<input type="checkbox"/>						
Employee B	<input type="checkbox"/>						
Employee C	<input type="checkbox"/>						

Thank you, we really appreciate your insight

Section 4: Employment costs

The purpose of this section is to collect information to use in estimating any additional employee costs to an organisation. These questions ask you to give answers on both an employee with autism in your organisation (Employee A), as well as two matching employees without autism.

4.1. Is there any current or prior Workers' Compensation claim for this employee?

	Yes	No	I do not know
Employee A (autism)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Employee B	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Employee C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4.2. Number of workers' compensation claims because of injuries (yearly):

	0	1-2	3-4	5-6	6+	Not Applicable
Employee A (autism)	<input type="checkbox"/>					
Employee B	<input type="checkbox"/>					
Employee C	<input type="checkbox"/>					

4.3. Have any changes to the workplace (e.g., facilities) or job procedures been made for employees (Multiple options allowed)?

	Ramps	Rails	Desks & Seating	Computer Adjustment	Lighting	Noise/Sound proofing	Barrier isolation spaces	Equipment Adjustment	Matting Flooring	Other	None
Employee A (autism)	<input type="checkbox"/>										
Employee B	<input type="checkbox"/>										
Employee C	<input type="checkbox"/>										

4.4. Please provide details of what "other" changes to the workplace (e.g., facilities) or job procedures was required for these employees:

4.5. Approximate total costs of the workplace changes:

	<\$500	\$501- \$1000	\$1001- \$2000	\$2001- \$5000	\$5001- \$10,000	> \$10,000	I do not know
Employee A (autism)	<input type="checkbox"/>						
Employee B	<input type="checkbox"/>						
Employee C	<input type="checkbox"/>						

4.6. Has this employee over the previous year had an unscheduled absence? *For example, medical, parental, bereavement, relocation, separation, or legal?*

	Yes	No	I do not know
Employee A (autism)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Employee B	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Employee C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4.7. How many unscheduled absences occurred over the previous six months?

	1-2 days	3-4 days	5-6 days	6+ days	Not Applicable
Employee A (autism)	<input type="checkbox"/>				
Employee B	<input type="checkbox"/>				
Employee C	<input type="checkbox"/>				

4.8. Average amount of supervision required for each employee per week:

	0	1-4 hours	5-8 hours	9-12 hours	13-30 hours	31-50 hours	51+ hours	Not Applicable
Employee A (autism)	<input type="checkbox"/>							
Employee B	<input type="checkbox"/>							
Employee C	<input type="checkbox"/>	<input checked="" type="checkbox"/>						

4.9. At your organisation approximately for how long has this employee with autism been employed?

	> 36 months	31-36 months	25-30 months	19-24 months	13-18 months	7-12 months	< 6 months
Employee A (autism)	<input type="checkbox"/>						
Employee B	<input type="checkbox"/>						
Employee C	<input type="checkbox"/>						

Thank you, we really appreciate your insight.

Survey Feedback

Were there any questions or topics in this survey missing that would have provided useful information?

Yes

No

If "yes", what else would be good for us to know?

Additional feedback is gratefully received:

Would you be interested in participating in other studies?

Yes

No

If "yes", please provide your contact information:

Name: _____

Email: _____

Mobile number: _____

Would you be interested in receiving a summary of the results of this study?

Yes

No

The results will be available in January 2016 and can be sent to you through email

Email: _____

Thank you for taking the time to complete this survey. We value your insight and contribution to autism research.

Appendix E SPIRT Guidelines



SPIRIT 2013 Checklist: Recommended items to address in a clinical trial protocol and related documents*

Section/item	Item No	Description	Addressed on page number
Administrative information			
Title	1	Descriptive title identifying the study design, population, interventions, and, if applicable, trial acronym	1
Trial registration	2a	Trial identifier and registry name. If not yet registered, name of intended registry	1 (available upon request currently blinded for review)
	2b	All items from the World Health Organization Trial Registration Data Set	NA
Protocol version	3	Date and version identifier	Original
Funding	4	Sources and types of financial, material, and other support	26
Roles and responsibilities	5a	Names, affiliations, and roles of protocol contributors	NA
	5b	Name and contact information for the trial sponsor	NA
	5c	Role of study sponsor and funders, if any, in study design; collection, management, analysis, and interpretation of data; writing of the report; and the decision to submit the report for publication, including whether they will have ultimate authority over any of these activities	26

	5d	Composition, roles, and responsibilities of the coordinating centre, steering committee, endpoint adjudication committee, data management team, and other individuals or groups overseeing the trial, if applicable (see Item 21a for data monitoring committee)	NA
Introduction			
Background and rationale	6a	Description of research question and justification for undertaking the trial, including summary of relevant studies (published and unpublished) examining benefits and harms for each intervention	3-5; 6-8
	6b	Explanation for choice of comparators	18
Objectives	7	Specific objectives or hypotheses	6
Trial design	8	Description of trial design including type of trial (eg, parallel group, crossover, factorial, single group), allocation ratio, and framework (eg, superiority, equivalence, noninferiority, exploratory)	17-18
Methods: Participants, interventions, and outcomes			
Study setting	9	Description of study settings (e.g., community clinic, academic hospital) and list of countries where data will be collected. Reference to where list of study sites can be obtained	14-16
Eligibility criteria	10	Inclusion and exclusion criteria for participants. If applicable, eligibility criteria for study centres and individuals who will perform the interventions (eg, surgeons, psychotherapists)	17
Interventions	11a	Interventions for each group with sufficient detail to allow replication, including how and when they will be administered	14-15; 18
	11b	Criteria for discontinuing or modifying allocated interventions for a given trial participant (eg, drug dose change in response to harms, participant request, or improving/worsening disease)	NA
	11c	Strategies to improve adherence to intervention protocols, and any procedures for monitoring adherence (eg, drug tablet return, laboratory tests)	18
	11d	Relevant concomitant care and interventions that are permitted or prohibited during the trial	NA

Outcomes	12	Primary, secondary, and other outcomes, including the specific measurement variable (eg, systolic blood pressure), analysis metric (eg, change from baseline, final value, time to event), method of aggregation (eg, median, proportion), and time point for each outcome. Explanation of the clinical relevance of chosen efficacy and harm outcomes is strongly recommended	19-20
Participant timeline	13	Time schedule of enrolment, interventions (including any run-ins and washouts), assessments, and visits for participants. A schematic diagram is highly recommended (see Figure)	18
Sample size	14	Estimated number of participants needed to achieve study objectives and how it was determined, including clinical and statistical assumptions supporting any sample size calculations	17
Recruitment	15	Strategies for achieving adequate participant enrolment to reach target sample size	16
Methods: Assignment of interventions (for controlled trials)			
Allocation:			
Sequence generation	16a	Method of generating the allocation sequence (e.g., computer-generated random numbers), and list of any factors for stratification. To reduce predictability of a random sequence, details of any planned restriction (eg, blocking) should be provided in a separate document that is unavailable to those who enrol participants or assign interventions	18
Allocation concealment mechanism	16b	Mechanism of implementing the allocation sequence (e.g., central telephone; sequentially numbered, opaque, sealed envelopes), describing any steps to conceal the sequence until interventions are assigned	18
Implementation	16c	Who will generate the allocation sequence, who will enrol participants, and who will assign participants to interventions	18
Blinding (masking)	17a	Who will be blinded after assignment to interventions (eg, trial participants, care providers, outcome assessors, data analysts), and how	18
	17b	If blinded, circumstances under which unblinding is permissible, and procedure for revealing a participant's allocated intervention during the trial	NA

Methods: Data collection, management, and analysis

Data collection methods	18a	Plans for assessment and collection of outcome, baseline, and other trial data, including any related processes to promote data quality (eg, duplicate measurements, training of assessors) and a description of study instruments (eg, questionnaires, laboratory tests) along with their reliability and validity, if known. Reference to where data collection forms can be found, if not in the protocol	19-20
	18b	Plans to promote participant retention and complete follow-up, including list of any outcome data to be collected for participants who discontinue or deviate from intervention protocols	18
Data management	19	Plans for data entry, coding, security, and storage, including any related processes to promote data quality (eg, double data entry; range checks for data values). Reference to where details of data management procedures can be found, if not in the protocol	26
Statistical methods	20a	Statistical methods for analysing primary and secondary outcomes. Reference to where other details of the statistical analysis plan can be found, if not in the protocol	21
	20b	Methods for any additional analyses (eg, subgroup and adjusted analyses)	NA
	20c	Definition of analysis population relating to protocol non-adherence (eg, as randomised analysis), and any statistical methods to handle missing data (eg, multiple imputation)	21
Methods: Monitoring			
Data monitoring	21a	Composition of data monitoring committee (DMC); summary of its role and reporting structure; statement of whether it is independent from the sponsor and competing interests; and reference to where further details about its charter can be found, if not in the protocol. Alternatively, an explanation of why a DMC is not needed	NA
	21b	Description of any interim analyses and stopping guidelines, including who will have access to these interim results and make the final decision to terminate the trial	NA
Harms	22	Plans for collecting, assessing, reporting, and managing solicited and spontaneously reported adverse events and other unintended effects of trial interventions or trial conduct	NA

Auditing	23	Frequency and procedures for auditing trial conduct, if any, and whether the process will be independent from investigators and the sponsor	NA
Ethics and dissemination			
Research ethics approval	24	Plans for seeking research ethics committee/institutional review board (REC/IRB) approval	21
Protocol amendments	25	Plans for communicating important protocol modifications (eg, changes to eligibility criteria, outcomes, analyses) to relevant parties (eg, investigators, REC/IRBs, trial participants, trial registries, journals, regulators)	NA
Consent or assent	26a	Who will obtain informed consent or assent from potential trial participants or authorised surrogates, and how (see Item 32)	21
	26b	Additional consent provisions for collection and use of participant data and biological specimens in ancillary studies, if applicable	NA
Confidentiality	27	How personal information about potential and enrolled participants will be collected, shared, and maintained in order to protect confidentiality before, during, and after the trial	21
Declaration of interests	28	Financial and other competing interests for principal investigators for the overall trial and each study site	Title page
Access to data	29	Statement of who will have access to the final trial dataset, and disclosure of contractual agreements that limit such access for investigators	26
Ancillary and post-trial care	30	Provisions, if any, for ancillary and post-trial care, and for compensation to those who suffer harm from trial participation	NA
Dissemination policy	31a	Plans for investigators and sponsor to communicate trial results to participants, healthcare professionals, the public, and other relevant groups (eg, via publication, reporting in results databases, or other data sharing arrangements), including any publication restrictions	22
	31b	Authorship eligibility guidelines and any intended use of professional writers	NA
	31c	Plans, if any, for granting public access to the full protocol, participant-level dataset, and statistical code	NA

Appendices

Informed consent materials	32	Model consent form and other related documentation given to participants and authorised surrogates	Available if requested
Biological specimens	33	Plans for collection, laboratory evaluation, and storage of biological specimens for genetic or molecular analysis in the current trial and for future use in ancillary studies, if applicable	NA

*It is strongly recommended that this checklist be read in conjunction with the SPIRIT 2013 Explanation & Elaboration for important clarification on the items. Amendments to the protocol should be tracked and dated. The SPIRIT checklist is copyrighted by the SPIRIT Group under the Creative Commons [“Attribution-NonCommercial-NoDerivs 3.0 Unported”](#) license.

Appendix F Information sheet informing the Employer Survey



School of Occupational Therapy and Social Work

Information sheet

Understanding the workplace for successful employment for adults on the autism spectrum

Understanding the workplace for successful employment for adults on the autism spectrum

What is this study about?

My name is Melissa Scott, from Curtin University. I am part of a research team that has developed a tool to assist employers of adults on the autism spectrum to adapt the work environment to facilitate a successful workplace. This tool is called the Integrated Employment Success Tool (IEST™).

We invite you to participate

You are invited to participate in this study because you presently employ adults on the autism spectrum and/or you are in the position to begin employing adults on the autism spectrum.

What will you be asked to do?

If you decide to take part in this study, we will ask you to use the IEST™ to help identify possible difficulties in the workplace experienced by your employee on the autism spectrum (e.g. working in a shared office). By using the IEST™ you will be able to make adjustments to the workplace to encourage a more suitable work environment. We will also ask you to complete a survey twice regarding employer confidence and attitudes toward disability. This will be completed in week 1 and week 12 of the study. The survey will take approximately 15 minutes to complete.

Are there any risks?

There are no known risks involved in participating in this study. Your participation is entirely voluntary. You are able to withdraw from the study at any given time without having to provide a reason, at which point you may ask that any of the information that you have supplied to be destroyed. However, if you do decide to withdraw from the study we ask that you return business as usual and continue to manage your employee on the autism spectrum according to your usual management procedure.

What might the benefits be?

You will assist us to improve work environments to make them more suitable for adults on the autism spectrum. Your feedback will provide us with information on your experience as an employer working with an adult on the autism spectrum and your employer confidence and attitudes. In the long term, we hope that by adapting the work environment to enhance work outcomes the “*employer-employee*” work relationship will be mutually beneficial in terms of financial gain and work satisfaction.

Confidentiality

All data will be stored and used confidentially. Results will be presented so that your name, personal information and business details will not be linked to your information. The data gathered will be published as scientific articles, as theses and presented at relevant conferences.

Further information

If you have any questions or concerns or you would like more information about the study, please do not hesitate to contact me on 9266 5164 (ask for Melissa Scott) or at melissa.scott@curtin.edu.au. Or, you can contact my supervisors, Professor Torbjörn Falkmer, Dr Sonya Girdler or Dr Marita Falkmer by telephone 9266 3600.

If you consent to participating in the study, we will contact you in the near future either by phone or email.

Thank you for your time and consideration.
Kind regards



Melissa Scott
PhD Candidate
School of Occupational Therapy and Social Work, Curtin University
Phone: 9266 5164, ask for Melissa Scott
Email: melissa.scott@curtin.edu.au



Dr Marita Falkmer
Post-Doctoral Fellow
School of Occupational Therapy and Social Work, Curtin University
Phone: 9266 3600
Email: marita.falkmer@curtin.edu.au



Dr Torbjörn Falkmer
Professor/Senior Research Fellow
School of Occupational Therapy and Social Work
Curtin University
Phone: 9266 3600
Email: t.falkmer@curtin.edu.au



Dr Sonya Girdler
Senior Lecturer
School of Occupational Therapy and Social Work
Curtin University
Phone: 9266 3600
Email: sonya.girdler@curtin.edu.au

**Appendix G CONSORT 2010 checklist of information to
include when reporting a randomised trial**



CONSORT 2010 checklist of information to include when reporting a randomised trial*

Section/Topic	Item No	Checklist item	Reported on page No
Title and abstract	1a	Identification as a randomised trial in the title	1
	1b	Structured summary of trial design, methods, results, and conclusions (for specific guidance see CONSORT for abstracts)	1
Introduction Background and objectives	2a	Scientific background and explanation of rationale	2-6
	2b	Specific objectives or hypotheses	6
Methods Trial design	3a	Description of trial design (such as parallel, factorial) including allocation ratio	6
	3b	Important changes to methods after trial commencement (such as eligibility criteria), with reasons	N/A
Participants	4a	Eligibility criteria for participants	7
	4b	Settings and locations where the data were collected	7-8
Interventions	5	The interventions for each group with sufficient details to allow replication, including how and when they were actually administered	8-11
Outcomes	6a	Completely defined pre-specified primary and secondary outcome measures, including how and when they were assessed	12-13
	6b	Any changes to trial outcomes after the trial commenced, with reasons	N/A
Sample size	7a	How sample size was determined	14
	7b	When applicable, explanation of any interim analyses and stopping guidelines	N/A

Randomisation:			8
Sequence generation	8a	Method used to generate the random allocation sequence	8
	8b	Type of randomisation; details of any restriction (such as blocking and block size)	8
Allocation concealment mechanism	9	Mechanism used to implement the random allocation sequence (such as sequentially numbered containers), describing any steps taken to conceal the sequence until interventions were assigned	8,11-12
Implementation	10	Who generated the random allocation sequence, who enrolled participants, and who assigned participants to interventions	8
Blinding	11a	If done, who was blinded after assignment to interventions (for example, participants, care providers, those assessing outcomes) and how	8
	11b	If relevant, description of the similarity of interventions	N/A
Statistical methods	12a	Statistical methods used to compare groups for primary and secondary outcomes	14-15
	12b	Methods for additional analyses, such as subgroup analyses and adjusted analyses	14-15
Results			
Participant flow (a diagram is strongly recommended)	13a	For each group, the numbers of participants who were randomly assigned, received intended treatment, and were analysed for the primary outcome	15-16
	13b	For each group, losses and exclusions after randomisation, together with reasons	15-16
Recruitment	14a	Dates defining the periods of recruitment and follow-up	11
	14b	Why the trial ended or was stopped	7-8
Baseline data	15	A table showing baseline demographic and clinical characteristics for each group	16

Numbers analysed	16	For each group, number of participants (denominator) included in each analysis and whether the analysis was by original assigned groups	16-19
Outcomes and estimation	17a	For each primary and secondary outcome, results for each group, and the estimated effect size and its precision (such as 95% confidence interval)	16-19
	17b	For binary outcomes, presentation of both absolute and relative effect sizes is recommended	N/A
Harms	19	All important harms or unintended effects in each group (for specific guidance see CONSORT for harms)	N/A
Discussion			
Limitations	20	Trial limitations, addressing sources of potential bias, imprecision, and, if relevant, multiplicity of analyses	24-25
Generalisability	21	Generalisability (external validity, applicability) of the trial findings	20-24
Interpretation	22	Interpretation consistent with results, balancing benefits and harms, and considering other relevant evidence	20-26
Other information			
Registration	23	Registration number and name of trial registry	1, 15
Protocol	24	Where the full trial protocol can be accessed, if available	6
Funding	25	Sources of funding and other support (such as supply of drugs), role of funders	Separate document

*We strongly recommend reading this statement in conjunction with the CONSORT 2010 Explanation and Elaboration for important clarifications on all the items. If relevant, we also recommend reading CONSORT extensions for cluster randomised trials, non-inferiority and equivalence trials, non-pharmacological treatments, herbal interventions, and pragmatic trials. Additional extensions are forthcoming: for those and for up to date references relevant to this checklist, see www.consort-statement.org.

**Appendix H Employer Survey
Baseline Measures**

**Employer Survey
Baseline Measures**

Dear Employer,

We would like to have a basic understanding of your workplace environment and your work experience with employees with autism. This survey consists of three sections exploring:

- Demographic information
- Confidence and knowledge employing people with autism
- Workplace attitudes towards disability

This survey will take approximately 15 minutes to complete.

If you have any questions or would like more information, please contact the primary researcher.

Thank you for your time and consideration.

CONSENT FORM

See attached information sheet for more details.

- I agree to participate in the study outlined to me
- I have been informed of and understand the purpose of the study
- I have had the opportunity to ask questions and they have been answered
- I understand that there are no known risks involved in the study
- I understand that participation is voluntary and that can withdraw at any time without reason or consequence
- I have been informed that all personal information will be kept confidential and any identifiable information will not be used in published material
- I agree that the information I provide can be used in other studies and/or publications

Name: _____

Job Title: _____

Email Address: _____

Contact numbers: Day time: _____ Mobile: _____

Signature: _____ Date: _____

Would you like to be informed about future studies? Yes No

Section 1A: Employer demographic survey

Instructions: Please answer the following questions to the best of your knowledge.

1. Please indicate your gender:
 - Male
 - Female
 - Prefer not to answer

2. Which category below indicates your age?
 - 18-20
 - 21-24
 - 25-34
 - 35-44
 - 45-54
 - 55-64
 - 65 years and over
 - Prefer not to answer

3. In which state or territory do you work?
 - Australian Capital Territory
 - New South Wales
 - Northern Territory
 - Queensland
 - South Australia
 - Tasmania
 - Victoria
 - Western Australia

4. What is your current employment status?
 - Full time employment
 - Part time employment
 - Casual employment
 - Other (Please specify):

5. Based on your current employment status, how many hours per week, on average do you work (excluding overtime)?
 - <10 hours
 - 11-15 hours
 - 16-20 hours
 - 21-25 hours
 - 26-30 hours

- 31-35 hours
 - >35 hours
 - Other (please specify):
-

6. Which of the following best describes the industry in which you work?

- Accommodation and Food Services
 - Agriculture, Forestry and Fishing
 - Arts and Recreation Services
 - Construction
 - Education and Training
 - Electricity, Gas, Water and Waste Services
 - Financial and Insurance Services
 - Information Media and Telecommunications
 - Health Care and Social Assistance
 - Manufacturing
 - Mining
 - Professional, Scientific and Technical Services
 - Public Administration and Safety
 - Rental, Hiring and Real Estate Services
 - Retail Trade
 - Transport, Postal and Warehousing
 - Wholesale Trade
 - Other (Please specify):
-

7. Which of the following best describes your role in the organisation?

- Managing director
 - Executive officer or senior manager
 - Small business owner
 - Manager
 - Supervisor
 - Employee
 - Other (Please specify):
-

8. How long have you been employed with this organisation?

- Less than 1 year
- 1-2 years
- 3-4 years
- More than 4 years

9. How much do you approximately earn per hour (before tax)?

- <\$30
- \$31-40
- \$41-50
- \$51-60

- \$61-70
- \$71-80
- \$81-90
- \$91-\$100
- > \$100
- Prefer not to answer

10. Which of the following best describe the approximate annual revenue of the organisation?

- Under \$100,000
- \$100,001-\$500,000
- \$500,001-\$1 million
- \$1,000,001 million-\$500 million
- \$5,000,001 million-\$1 billion
- More than \$1 billion
- I do not know

11. How many people does your organisation approximately employ?

- 1-20
- 21-50
- 51-100
- 101-250
- 251-500
- 501-1000
- 1001-2500
- More than 2500

12. How many people currently work in your department?

- Less than 10
- 11-20
- 21-50
- 51-100
- 101-250
- More than 250

Section 1B: Experience working with adults with Autism

13. Do you have any prior experience working with people with a disability in an employment setting?

- Yes
- No

If “Yes”, how would you describe your experience?

- Very Negative
- Negative

- Neither Positive nor Negative
- Positive
- Very Positive

14. How many employees with autism does your organisation currently employ?

- 0
- 1
- 2
- 3
- 4
- 5
- 6+
- I am not sure

15. What is your role in relation to the employee(s) with autism?

- Manager
- Supervisor
- Co-ordinator
- Mentor
- Co-worker
- Other (Please specify): _____

16. Overall, how long have you worked with the employee(s) with autism?

- Less than 1 year
- 1-2 years
- 3-4 years
- More than 4 years
- I do not know

17. In your current job role in the organisation, how many employees with autism do you support?

- 1
- 2
- 3
- 4
- 5
- 6+
- I am not sure

18. In your current job role in the organisation, how long have you supported an employee with autism?

- Less than 3 months
- 3-6 months
- Less than 1 year
- 1-2 years
- 3-4 years

- More than 4 years
- I do not know

19. How many hours per week do you approximately spend providing support to an employee(s) with autism?

- 0 hours
- 1-4 hours
- 5-9 hours
- 10+ hours
- I do not know
- It varies

20. Do you have the support of a Disability Employment Service provider?

- Yes
- No

If 'Yes', how often do you require the support of the Disability Employment Provider?

- Weekly
- Fortnightly
- Monthly
- It varies (Flexible between 4-6 weeks)
- I do not know

-----End of Section 1-----

Section 2:

Employer Self-Efficacy Scale

We would like to understand and measure the experiences of employers who are employing adults with autism in their workplace. More specifically, we would like to know how *confident* you are in supporting adults with autism at different stages during the employment process.

The term, “**employer**” is a general term used to refer to the individual in your organisation who works directly with the employee(s) with autism in the workplace. This may include business owners, managers, supervisors, co-workers, and/or mentors.

Instructions: Please rate how *confident* you are at supporting adults with autism in your workplace. To indicate your response, please circle/highlight a number in each row below which best describes your response to the questions, where 1 = *Not at All Confident* to 10 = *Completely Confident*

<i>How confident do you feel that you can support an adult with autism...</i>		Not at All Confident									Completely Confident
1	During recruitment?	1	2	3	4	5	6	7	8	9	10
2	In developing a targeted job description?	1	2	3	4	5	6	7	8	9	10
3	In making reasonable adjustments during the recruitment process?	1	2	3	4	5	6	7	8	9	10
4	In adapting the job interview process?	1	2	3	4	5	6	7	8	9	10
5	During a job trial?	1	2	3	4	5	6	7	8	9	10
6	During the interview process without the help of a Disability Employment Support provider?	1	2	3	4	5	6	7	8	9	10
7	In employing the individual in your organisation?	1	2	3	4	5	6	7	8	9	10
8	Based on your current knowledge in autism?	1	2	3	4	5	6	7	8	9	10
9	By identifying their workplace challenges?	1	2	3	4	5	6	7	8	9	10
10	In developing a Support Plan (a flexible plan for workplace support)?	1	2	3	4	5	6	7	8	9	10
11	When deciding on workplace modifications?	1	2	3	4	5	6	7	8	9	10
12	By implementing workplace modifications?	1	2	3	4	5	6	7	8	9	10

<i>How confident do you feel that you can support an adult with autism...</i>		Not at All Confident									Completely Confident
13	During social situations in the workplace (social greetings, conversational topics, networking and/or events)?	1	2	3	4	5	6	7	8	9	10
14	In communicating according to their needs?	1	2	3	4	5	6	7	8	9	10
15	In managing stressful and anxiety provoking situations?	1	2	3	4	5	6	7	8	9	10
16	In resolving conflict that may occur between them and their co-workers?	1	2	3	4	5	6	7	8	9	10
17	In managing conflict between yourself and the employee with autism?	1	2	3	4	5	6	7	8	9	10
18	By identifying their workplace strengths?	1	2	3	4	5	6	7	8	9	10
19	In educating their co-workers about autism?	1	2	3	4	5	6	7	8	9	10
20	Within current company resources?	1	2	3	4	5	6	7	8	9	10

----- End of Section 2 -----

Section 3

Workers Scale Form A

Rehabilitation Research and Training Center Virginia Commonwealth University Richmond, Virginia, USA and Keio University, Tokyo, Japan Joint Project

Instructions:

On the next two pages, there are 25 statements that represent people's feelings toward workers with disabilities. Please respond to each item by circling the number that most describes your level of agreement with the statement. The meaning of the number (from -3 to +3) is provided on the top of each page.

There is no correct or wrong answer. Please respond to the statements according to your own feelings.

After you have completed the 25 statements, please choose the three (3) items that best fit your own feelings toward and experiences with workers with disabilities, and write the item letters in the spaces provided at the bottom of the second page.

For each item, please circle the number from -3 to +3 that most fits your feelings.							
-3 = Strongly Disagree		+1 = Slightly Agree					
-2 = Disagree	0 = Undecided	+2 = Agree					
-1 = Slightly Disagree		3 = Strongly Agree					
	Strongly Disagree	Disagree	Slightly Disagree	Undecided	Slightly Agree	Agree	Strongly Agree
(a) Workers with disabilities get the job done.	-3	-2	-1	0	+1	+2	+3
(b) Employers need to meet the person with a disability first, before employing him/her through a special employment program for people with disabilities.	-3	-2	-1	0	+1	+2	+3
(c) Workers with disabilities are just like everyone else.	-3	-2	-1	0	+1	+2	+3
(d) A business will hire anyone who meets its employment standards.	-3	-2	-1	0	+1	+2	+3
(e) Workers with disabilities are nervous about being alone (without the job coach or human service worker).	-3	-2	-1	0	+1	+2	+3
(f) People with disabilities won't be able to meet the production standards.	-3	-2	-1	0	+1	+2	+3
(g) Everyone ought to have the opportunity to work.	-3	-2	-1	0	+1	+2	+3
(h) Employers are concerned about the absenteeism of workers with disabilities.	-3	-2	-1	0	+1	+2	+3
(i) People with disabilities should have to compete for an interview like everyone else.	-3	-2	-1	0	+1	+2	+3
(j) Employers don't have the time or resources to spend on a person with a disability.	-3	-2	-1	0	+1	+2	+3
(k) Businesses wouldn't employ someone with a disability if there weren't a tax credit.	-3	-2	-1	0	+1	+2	+3
(l) Employers are concerned about working with the person with a disability after the employment specialist leaves	-3	-2	-1	0	+1	+2	+3
(m) The work environment is no place for people with disabilities.	-3	-2	-1	0	+1	+2	+3
(n) People with disabilities deserve the same opportunities as everyone else.	-3	-2	-1	0	+1	+2	+3
(o) The workers with disabilities don't catch on and can't follow directions.	-3	-2	-1	0	+1	+2	+3
(p) Employers feel that they would have to monitor an employee with a disability continuously.	-3	-2	-1	0	+1	+2	+3

For each item, please circle the number from -3 to +3 that most fits your feelings.							
-3 = Strongly Disagree				+1 = Slightly Agree			
-2 = Disagree	0 = Undecided			+2 = Agree			
-1 = Slightly Disagree				3 = Strongly Agree			
	Strongly Disagree	Disagree	Slightly Disagree	Undecided	Slightly Agree	Agree	Strongly Disagree
(a) Sometimes the workers with disabilities require more time than expected.	-3	-2	-1	0	+1	+2	+3
(b) If something goes wrong, or is done wrong, it probably is the fault of the employee with a disability.	-3	-2	-1	0	+1	+2	+3
(c) Some businesses don't have positions appropriate for people with disabilities.	-3	-2	-1	0	+1	+2	+3
(d) People with disabilities won't be able to get along with other people on the job.	-3	-2	-1	0	+1	+2	+3
(e) Workers with disabilities are doing better than anticipated.	-3	-2	-1	0	+1	+2	+3
(f) Employers would like to meet the applicant before deciding whether or not to work with a person with a disability.	-3	-2	-1	0	+1	+2	+3
(g) It would be too stressful for a person with a disability to try to earn a wage.	-3	-2	-1	0	+1	+2	+3
(h) Employees with disabilities have a positive influence on employees without disabilities.	-3	-2	-1	0	+1	+2	+3
(i) People with disabilities should have the chance to work.	-3	-2	-1	0	+1	+2	+3

Please write here the letters of the three (3) items above that you think fit your feelings best: _____

Thank you for your cooperation.

*Thank you for your participation and contribution to autism research
-----End of Survey-----*

Employer Survey
Post-Test Measures

Dear Employer,

Congratulations! You have reached week 12 of the IEST trial study. You only have one more survey to complete. This survey is similar to the one you initially completed in week 1 of this study, with the exception of the demographics section.

This survey consists of three sections exploring:

- Confidence and knowledge employing people with autism
- Feedback on the IEST tool
- Workplace attitudes toward disability

This survey will take approximately 10 minutes to complete.

If you have any questions or would like more information, please contact the primary researcher.

Thank you for your time and consideration.

Section 1:

Employer Self-Efficacy Scale

We would like to understand and measure the experiences of employers who are employing adults with autism in their workplace. More specifically, we would like to know how *confident* you are in supporting adults with autism at different stages during the employment process.

The term, “**employer**” is a general term used to refer to the individual in your organisation who works directly with the employee(s) with autism in the workplace. This may include business owners, managers, supervisors, co-workers, and/or mentors.

Instructions: Please rate how *confident* you are at supporting adults with autism in your workplace. To indicate your response, please circle/highlight a number in each row below which best describes your response to the questions, where 1 = *Not at All Confident* to 10 = *Completely Confident*

<i>How confident do you feel that you can support an adult with autism...</i>		Not at All Confident									Completely Confident
1	During recruitment?	1	2	3	4	5	6	7	8	9	10
2	In developing a targeted job description?	1	2	3	4	5	6	7	8	9	10
3	In making reasonable adjustments during the recruitment process?	1	2	3	4	5	6	7	8	9	10
4	In adapting the job interview process?	1	2	3	4	5	6	7	8	9	10
5	During a job trial?	1	2	3	4	5	6	7	8	9	10
6	During the interview process without the help of a Disability Employment Support provider?	1	2	3	4	5	6	7	8	9	10
7	In employing the individual in your organisation?	1	2	3	4	5	6	7	8	9	10
8	Based on your current knowledge in autism?	1	2	3	4	5	6	7	8	9	10
9	By identifying their workplace challenges?	1	2	3	4	5	6	7	8	9	10
10	In developing a Support Plan (a flexible plan for workplace support)?	1	2	3	4	5	6	7	8	9	10
11	When deciding on workplace modifications?	1	2	3	4	5	6	7	8	9	10
12	By implementing workplace modifications?	1	2	3	4	5	6	7	8	9	10

<i>How confident do you feel that you can support an adult with autism...</i>		Not at All Confident									Completely Confident
13	During social situations in the workplace (social greetings, conversational topics, networking and/or events)?	1	2	3	4	5	6	7	8	9	10
14	In communicating according to their needs?	1	2	3	4	5	6	7	8	9	10
15	In managing stressful and anxiety provoking situations?	1	2	3	4	5	6	7	8	9	10
16	In resolving conflict that may occur between them and their co-workers?	1	2	3	4	5	6	7	8	9	10
17	In managing conflict between yourself and the employee with autism?	1	2	3	4	5	6	7	8	9	10
18	By identifying their workplace strengths?	1	2	3	4	5	6	7	8	9	10
19	In educating their co-workers about autism?	1	2	3	4	5	6	7	8	9	10
20	Within current company resources?	1	2	3	4	5	6	7	8	9	10

-----End of Section 1-----

Section 2:

Feedback on the IEST™ workplace tool

1. How often have you used the IEST tool?

Not at all

Daily

Weekly

Fortnightly

Monthly

Other (Please specify): _____

2. Who else in your workplace frequently uses the IEST tool?

Manager

Supervisor

Mentor

Co-worker

Disability Employment Service provider co-ordinator

Other (Please specify): _____

3. For what purposes have you mainly used the IEST tool (*Please provide an example*)?

4. What are the limitations of the IEST tool in your workplace (*Please provide an example*)? _____

5. If any, what other workplace areas should the IEST address for employees with autism? _____

6. If any, what other recommendations would you suggest for the improvement of the IEST tool? _

7. Overall, how satisfied are you with the use of the IEST tool in your workplace?

- Very dissatisfied
- Dissatisfied
- Neutral
- Satisfied
- Very satisfied

8. In what format would you prefer the IEST tool?

- Paper-based
- Web-based
- Both

-----End of Section 2-----

Section 3

Workers Scale Form A

Rehabilitation Research and Training Center Virginia Commonwealth University Richmond, Virginia, USA and Keio University, Tokyo, Japan Joint Project

Instructions:

On the next two pages, there are 25 statements that represent people's feelings toward workers with disabilities. Please respond to each item by circling the number that most describes your level of agreement with the statement. The meaning of the number (from -3 to +3) is provided on the top of each page.

There is no correct or wrong answer. Please respond to the statements according to your own feelings.

After you have completed the 25 statements, please choose the three (3) items that best fit your own feelings toward and experiences with workers with disabilities, and write the item letters in the spaces provided at the bottom of the second page

For each item, please circle the number from -3 to +3 that most fits your feelings.							
-3 = Strongly Disagree		+1 = Slightly Agree					
-2 = Disagree	0 = Undecided	+2 = Agree					
-1 = Slightly Disagree		3 = Strongly Agree					
	Strongly Disagree	Disagree	Slightly Disagree	Undecided	Slightly Agree	Agree	Strongly Agree
(a) Workers with disabilities get the job done.	-3	-2	-1	0	+1	+2	+3
(b) Employers need to meet the person with a disability first, before employing him/her through a special employment program for people with disabilities.	-3	-2	-1	0	+1	+2	+3
(c) Workers with disabilities are just like everyone else.	-3	-2	-1	0	+1	+2	+3
(d) A business will hire anyone who meets its employment standards.	-3	-2	-1	0	+1	+2	+3
(e) Workers with disabilities are nervous about being alone (without the job coach or human service worker).	-3	-2	-1	0	+1	+2	+3
(f) People with disabilities won't be able to meet the production standards.	-3	-2	-1	0	+1	+2	+3
(g) Everyone ought to have the opportunity to work.	-3	-2	-1	0	+1	+2	+3
(h) Employers are concerned about the absenteeism of workers with disabilities.	-3	-2	-1	0	+1	+2	+3
(i) People with disabilities should have to compete for an interview like everyone else.	-3	-2	-1	0	+1	+2	+3
(j) Employers don't have the time or resources to spend on a person with a disability.	-3	-2	-1	0	+1	+2	+3
(k) Businesses wouldn't employ someone with a disability if there weren't a tax credit.	-3	-2	-1	0	+1	+2	+3
(l) Employers are concerned about working with the person with a disability after the employment specialist leaves	-3	-2	-1	0	+1	+2	+3
(m) The work environment is no place for people with disabilities.	-3	-2	-1	0	+1	+2	+3
(n) People with disabilities deserve the same opportunities as everyone else.	-3	-2	-1	0	+1	+2	+3
(o) The workers with disabilities don't catch on and can't follow directions.	-3	-2	-1	0	+1	+2	+3
(p) Employers feel that they would have to monitor an employee with a disability continuously.	-3	-2	-1	0	+1	+2	+3

For each item, please circle the number from -3 to +3 that most fits your feelings.									
-3 = Strongly Disagree		+1 = Slightly Agree							
-2 = Disagree	0 = Undecided	+2 = Agree							
-1 = Slightly Disagree		3 = Strongly Agree							
			Strongly Disagree	Disagree	Slightly Disagree	Undecided	Slightly Agree	Agree	Strongly Disagree
(a) Sometimes the workers with disabilities require more time than expected.			-3	-2	-1	0	+1	+2	+3
(b) If something goes wrong, or is done wrong, it probably is the fault of the employee with a disability.			-3	-2	-1	0	+1	+2	+3
(c) Some businesses don't have positions appropriate for people with disabilities.			-3	-2	-1	0	+1	+2	+3
(d) People with disabilities won't be able to get along with other people on the job.			-3	-2	-1	0	+1	+2	+3
(e) Workers with disabilities are doing better than anticipated.			-3	-2	-1	0	+1	+2	+3
(f) Employers would like to meet the applicant before deciding whether or not to work with a person with a disability.			-3	-2	-1	0	+1	+2	+3
(g) It would be too stressful for a person with a disability to try to earn a wage.			-3	-2	-1	0	+1	+2	+3
(h) Employees with disabilities have a positive influence on employees without disabilities.			-3	-2	-1	0	+1	+2	+3
(i) People with disabilities should have the chance to work.			-3	-2	-1	0	+1	+2	+3

Please write here the letters of the three (3) items above that you think fit your feelings best: _____

Thank you for your cooperation.

*Thank you for your participation and contribution to autism research
-----End of Survey-----*

Appendix I Interview guide: Process Evaluation of the IEST™

Interview guide: Process Evaluation of the IEST™

1. In your experience was the IEST™ a good fit in your work environment?
2. For what purposes did you use the IEST™ in your workplace?
3. In what ways did the IEST™ contribute to your confidence and knowledge in supporting employees on the autism spectrum?
4. What features of the IEST™ were helpful or made a difference in your workplace?
(e.g., different chapters in the IEST™ such as advertising the job, the interview, job commencement and placement, workplace modification or ongoing support)
5. To what extent did the IEST™ meet your needs?
6. What were the limitations of the IEST™ in your workplace?
7. Based on your previous experience working with employees on the autism spectrum, do you think the IEST™ was helpful/unhelpful?
8. Do you think the IEST™ would be more helpful to a new employer who have not previously employed an individual on the autism spectrum?
9. What other workplace areas should the IEST™ have addressed?
10. What recommendations would you suggest for the improvement of the IEST™ tool?

Appendix J The Integrated Employment Success Tool (IEST™)

Due to Intellectual Property obligations, claims or restrictions imposed by an external organisation, the Autism CRC that supported this research, this appendix is permanently exempt from this thesis and cannot be made publicly available online at time. Please contact the Autism CRC for access or more information about the IEST™.