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

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

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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: 

Date: 20/11/2017
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Dedication

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

List of published manuscripts


List of manuscripts under review


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, 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. 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.


Statement of Author Contribution

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

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(Primary supervisor)

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(Secondary supervisor)

Professor Sonya Girdler
(Secondary supervisor)

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

Introduction

Chapter 1

Introduction


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 chapter was written as a publication, which is unable to be reproduced here due to copyright restrictions.


This publication can instead be accessed via:

http://journals.sagepub.com/home/aut
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.

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RESEARCH ARTICLE

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

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* These authors contributed equally to this work.

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, 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 2.3 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, adults 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
likely to participate in daytime activities than those with ASD who have an intellectual impairment [6, 7]. For many individuals with ASD, interpersonal difficulties have the largest impact on their ability to apply for and maintain stable employment [6, 7]. 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 external 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 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 remain 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 individuals with ASD participating in the workplace [12]. 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 their 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 the 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 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 32 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 32 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][22]. 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.
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 x 1:\(\sqrt{\text{no. of items in Q set}}\). 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% of the explained variance in the employee group and 62% 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 (HREC14/2014) 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 (3: −4; 4: +9). This required a manager to be approachable, effective and direct in communicating and invested in

Table 1. Participant demographics.

<table>
<thead>
<tr>
<th>Employee n = 40</th>
<th>Employer n = 35</th>
</tr>
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<tbody>
<tr>
<td>Age (years)</td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>29.1 (10.7)</td>
</tr>
<tr>
<td>Median</td>
<td>26</td>
</tr>
<tr>
<td>Gender (n)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>24 (80%)</td>
</tr>
<tr>
<td>Female</td>
<td>16 (60%)</td>
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<tr>
<td>Employment Status (n)</td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>30 (79%)</td>
</tr>
<tr>
<td>Unemployed</td>
<td>9 (22%)</td>
</tr>
<tr>
<td>Retired</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>Q sort completion time (min)</td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>31 (16.6)</td>
</tr>
<tr>
<td>Median</td>
<td>20</td>
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<tr>
<td>Range</td>
<td>175</td>
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doi: 10.1371/journal.pone.0139281.s001
Table 2. Employee Viewpoint One.

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

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 fulfill their role and a thorough understanding of the workplace culture and job expectations (24;+6, 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 20.3 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 (41;+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.

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

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 (37; 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 difficult 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; 5).
Table 4. Employee Viewpoint Three.

<table>
<thead>
<tr>
<th>Statements</th>
<th>Viewpoints</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 It would be good if an employee could have weekly contact with an employment co-ordinator to discuss their work tasks (e.g., breaking the steps of a big task down into smaller tasks, workplace difficulties)</td>
<td>1 2 3</td>
</tr>
<tr>
<td>34 The lighting of the room can affect an employee’s ability to work</td>
<td>-1 -2 6</td>
</tr>
<tr>
<td>28 Constant, high level of support from an employment co-ordinator is required, even when an employee’s confidence in work skills increases</td>
<td>-2 -5 5</td>
</tr>
<tr>
<td>2 It is helpful when the support required from an employment co-ordinator is re-assessed and adjusted after the probation period</td>
<td>3 3 5</td>
</tr>
<tr>
<td>22 Job trials are helpful to demonstrate specific skills required in a workplace</td>
<td>0 1 5</td>
</tr>
<tr>
<td>43 Participating in a job trial is better than attending a face-to-face interview</td>
<td>-2 0 4</td>
</tr>
<tr>
<td>46 It would be helpful to research the workplace website before doing a job interview</td>
<td>0 2 4</td>
</tr>
<tr>
<td>21 Job trials help identify areas where more support is needed (e.g., identifying how tasks can be simplified or specifically adjusted)</td>
<td>4 0 4</td>
</tr>
<tr>
<td>48 Job matching employees to their specific interests motivates work participation</td>
<td>3 5 4</td>
</tr>
<tr>
<td>51 It is not important that employees are motivated by their work</td>
<td>-4 6 4</td>
</tr>
<tr>
<td>39 It is easier to engage in social conversations when topics are initiated by work colleagues, rather than initiating them</td>
<td>0 2 4</td>
</tr>
<tr>
<td>52 Being able to work is important for independence</td>
<td>2 6 4</td>
</tr>
<tr>
<td>50 Workplace mentors can assist with daily work issues</td>
<td>2 6 4</td>
</tr>
<tr>
<td>26 To be productive at work a thorough understanding of job expectations is essential</td>
<td>0 6 4</td>
</tr>
<tr>
<td>29 If required, workplace mentors can give advice on appropriate social behaviour</td>
<td>1 5 3</td>
</tr>
<tr>
<td>36 Short, regular breaks during the day interrupt with concentration</td>
<td>-4 -1 5</td>
</tr>
<tr>
<td>6 Education training on Autism Spectrum Disorders for all employed staff is unnecessary in the workplace environment</td>
<td>0 4 4</td>
</tr>
<tr>
<td>47 The process of finding a job is difficult</td>
<td>2 3 6</td>
</tr>
</tbody>
</table>

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: +6; 15: +5). Team support was reliant on a manager who promoted a fair workplace, provided honest feedback and was approachable (31: -5; 16: +6; 16: +6; 3: +6). 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 as 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: +8; 39: +6; 37: +6). Participants viewed financial assistance and ongoing support from disability employment service providers as helpful when making workplace
Table 5. Employer Viewpoint One.

<table>
<thead>
<tr>
<th>Statements</th>
<th>Viewpoints</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Increased support is required for employees 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).</td>
<td>6 1 2</td>
</tr>
<tr>
<td>2 The development of an individual support plan (i.e., provides clarity on the type, frequency and duration of support required) is essential in achieving successful work outcomes</td>
<td>6 1 1</td>
</tr>
<tr>
<td>3 It is important that managers are approachable in the workplace</td>
<td>5 6 2</td>
</tr>
<tr>
<td>4 A good manager assists in resolving conflict between employees to help the workplace fair and equal</td>
<td>5 6 1</td>
</tr>
<tr>
<td>5 Readily available support from an employment co-ordinator is essential to help with difficult work situations</td>
<td>5 1 -4</td>
</tr>
<tr>
<td>6 Job trials are helpful to demonstrate specific skills required in a workplace</td>
<td>4 0 3</td>
</tr>
<tr>
<td>7 Being direct with colleagues is helpful when asking work related questions</td>
<td>4 0 0</td>
</tr>
<tr>
<td>8 Job trials help identify areas where more support is needed (e.g., identifying how tasks can be simplified or specifically adjusted)</td>
<td>4 2 -1</td>
</tr>
<tr>
<td>9 Receiving honest feedback on work performance assists with personal and professional development</td>
<td>4 4 -2</td>
</tr>
<tr>
<td>10 Communication skills (e.g., listening when others are talking, responding and interacting to conversations, body language) are important in most workplaces</td>
<td>-4 5 -2</td>
</tr>
<tr>
<td>11 Education training on Autism Spectrum Disorders for all employed staff is unnecessary in the workplace</td>
<td>-4 -4 3</td>
</tr>
<tr>
<td>12 Working in a large team (4 or more people) is better than working in a small team (2-3 people)</td>
<td>-4 -3 4</td>
</tr>
<tr>
<td>13 It is not important that employees are motivated by their work</td>
<td>-4 -3 6</td>
</tr>
<tr>
<td>14 Reporting to several different managers, rather than one main manager for work is preferable</td>
<td>-5 -6 -1</td>
</tr>
<tr>
<td>15 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</td>
<td>-5 -6 -2</td>
</tr>
<tr>
<td>16 Regular follow up by an employment co-ordinator during the probation period hinders the work progress</td>
<td>-5 -4 3</td>
</tr>
<tr>
<td>17 Working on a regular basis decreases job satisfaction</td>
<td>-6 -6 -1</td>
</tr>
<tr>
<td>18 Ongoing support from an employment co-ordinator limits work performance</td>
<td>-6 -4 0</td>
</tr>
</tbody>
</table>

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 statistic 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.

<table>
<thead>
<tr>
<th>Statements</th>
<th>Viewpoints</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 It is important that managers are approachable in the workplace</td>
<td>5  6  2</td>
</tr>
<tr>
<td>14 A good manager assists in resolving conflict between employees to help keep the workplace fair and equal</td>
<td>5  6  1</td>
</tr>
<tr>
<td>11 Commitment to work is a valuable employee attribute</td>
<td>3  5  2</td>
</tr>
<tr>
<td>41 On-the-job training helps with understanding the workplace rules (e.g., start times, finish times, breaks)</td>
<td>1  5  1</td>
</tr>
<tr>
<td>42 Being able to work is important for independence</td>
<td>2  5  6</td>
</tr>
<tr>
<td>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</td>
<td>2  4  3</td>
</tr>
<tr>
<td>49 Punctuality is important in the workplace</td>
<td>1  4  2</td>
</tr>
<tr>
<td>24 It is important to have the right skills and abilities to contribute to the needs and productivity requirements of the workplace</td>
<td>2  4  2</td>
</tr>
<tr>
<td>4 Receiving honest feedback on work performance assists with personal and professional development</td>
<td>4  4  2</td>
</tr>
<tr>
<td>52 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)</td>
<td>-3 -4  0</td>
</tr>
<tr>
<td>10 Ongoing support from an employment co-ordinator limits work performance</td>
<td>-4 -4  0</td>
</tr>
<tr>
<td>6 Education training on Autism Spectrum Disorders for all employed staff is unnecessary in the work environment</td>
<td>-4 -4  3</td>
</tr>
<tr>
<td>3 Regular follow up by an employment co-ordinator during the probation period hinders the work progress</td>
<td>-5 -4  3</td>
</tr>
<tr>
<td>15 Communication skills (e.g., listening when others are talking, responding and interacting to conversations, body language) are unimportant in most workplaces</td>
<td>-4 -5  2</td>
</tr>
<tr>
<td>31 Reporting to several different managers, rather than one main manager for work is preferable</td>
<td>-5 -5  1</td>
</tr>
<tr>
<td>28 Constant, high level of support from an employment co-ordinator is required, even when an employee’s confidence in work skills increases</td>
<td>-3 -5  4</td>
</tr>
<tr>
<td>27 Working on a regular basis decreases job satisfaction</td>
<td>-4 -6  1</td>
</tr>
<tr>
<td>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</td>
<td>-4 -6  2</td>
</tr>
</tbody>
</table>

doi: 10.1371/journal.pone.0139281.e006

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.

<table>
<thead>
<tr>
<th>Statements</th>
<th>Viewpoints</th>
</tr>
</thead>
<tbody>
<tr>
<td>52 Being able to work is important for independence</td>
<td>2 5 6</td>
</tr>
<tr>
<td>51 It is not important that employees are motivated by their work</td>
<td>-4 -3 6</td>
</tr>
<tr>
<td>26 To be productive at work a thorough understanding of job expectations is essential</td>
<td>3 1 5</td>
</tr>
<tr>
<td>18 Financial assistance from the Employment Assistance Fund is helpful in allowing workplaces to make workplace adjustments</td>
<td>0 -2 5</td>
</tr>
<tr>
<td>17 Assistance from an employment co-ordinator is necessary when applying for funding for workplace adjustments</td>
<td>-2 1 5</td>
</tr>
<tr>
<td>43 Participating in a job trial is better than attending a face-to-face interview</td>
<td>0 2 4</td>
</tr>
<tr>
<td>47 The process of finding a job is difficult</td>
<td>-1 1 4</td>
</tr>
<tr>
<td>12 Working in a large team (4 or more people) is better than working in a small team (2-3 people)</td>
<td>-1 -3 4</td>
</tr>
<tr>
<td>28 Constant, high level of support from an employment co-ordinator is required, even when an employer’s confidence in work skills increases</td>
<td>-3 -3 4</td>
</tr>
<tr>
<td>39 It is easier to engage in social conversations when topics are initiated by work colleagues, rather than initiating them</td>
<td>-2 -2 -4</td>
</tr>
<tr>
<td>29 If required, workplace mentors can give advice on appropriate social behaviour</td>
<td>1 0 -4</td>
</tr>
<tr>
<td>48 Job matching employees to their specific interests motivates work participation</td>
<td>2 0 -4</td>
</tr>
<tr>
<td>33 It would be helpful to use technology to assist with on-the-job learning (e.g., use of the iPad for video modelling, to increase work speed and accuracy, visual prompts or work schedule)</td>
<td>-1 -2 -4</td>
</tr>
<tr>
<td>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).</td>
<td>0 -2 -5</td>
</tr>
<tr>
<td>23 Businesses value a broad range of skills in their employees (e.g., communication, problem-solving, learning, technology)</td>
<td>-1 -3 -5</td>
</tr>
<tr>
<td>50 Workplace mentors can assist with daily work issues</td>
<td>3 0 -3</td>
</tr>
<tr>
<td>34 The lighting of the room can affect an employee’s ability to work</td>
<td>-1 0 -6</td>
</tr>
<tr>
<td>37 It is OK to choose to be alone during the lunchbreak</td>
<td>-1 -1 -6</td>
</tr>
</tbody>
</table>

doi: 10.1371/journal.pone.0139281

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 [12]. The ICF highlights the necessary role that environmental factors play in acting as a facilitator or barrier to participation [23]. 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 51 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 51 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 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 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 and may result in demotivated employees, poor work performance, stress and increased employee turnover [28]. 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 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 [28]. Using the ICF environmental component, employees require a supportive, structured and task-adapted work environment to perform their jobs successfully [7,31]. 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].
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 employers and employees 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 workplace 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 Allitech. 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.

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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


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.

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

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Abstract
Research has examined the benefits and costs of employing adults with autism spectrum disorder (ASD) from the perspective of the employer, 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) 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 [3]. The term ASD is amongst 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...
Employers' perception of the costs and the benefits of hiring individuals with autism spectrum disorder in open employment in Australia

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 [34]. 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 Cimineria [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, Cimineria [45, 46] proposed a "matched sample" framework whereby
Table 1. Characteristics of employers and organisations.

<table>
<thead>
<tr>
<th>Industry</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health care and social assistance</td>
<td>15</td>
<td>26.3</td>
</tr>
<tr>
<td>Retail trade</td>
<td>9</td>
<td>15.8</td>
</tr>
<tr>
<td>Education and training</td>
<td>6</td>
<td>10.5</td>
</tr>
<tr>
<td>Professional, scientific and technical services</td>
<td>5</td>
<td>8.8</td>
</tr>
<tr>
<td>Accommodation and food services</td>
<td>4</td>
<td>7.0</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>4</td>
<td>7.0</td>
</tr>
<tr>
<td>Other services</td>
<td>4</td>
<td>7.0</td>
</tr>
<tr>
<td>Information, media and telecommunications</td>
<td>2</td>
<td>3.5</td>
</tr>
<tr>
<td>Rental, hiring and real estate</td>
<td>2</td>
<td>3.5</td>
</tr>
<tr>
<td>Public administration and safety</td>
<td>2</td>
<td>3.5</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>7.0</td>
</tr>
<tr>
<td>Main client base</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local community</td>
<td>24</td>
<td>41.4</td>
</tr>
<tr>
<td>State-wide</td>
<td>18</td>
<td>27.6</td>
</tr>
<tr>
<td>National</td>
<td>11</td>
<td>19.0</td>
</tr>
<tr>
<td>International</td>
<td>7</td>
<td>12.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of full-time employees</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;5</td>
<td>10</td>
</tr>
<tr>
<td>6–10</td>
<td>4</td>
</tr>
<tr>
<td>11–20</td>
<td>8</td>
</tr>
<tr>
<td>20–100</td>
<td>14</td>
</tr>
<tr>
<td>&gt;100</td>
<td>16</td>
</tr>
</tbody>
</table>

1 Excludes 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 Camara’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 31% 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 5% 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 (10.0%) 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 IDS providers, and 2) cold calling multiple businesses and organisations Australia-wide. The initial recruitment process depended heavily on the assistance from autism organisations and IDS providers contacting their employer database list as employing individuals with ASD. Many IDS 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 ($n = 122$). 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 Cnossen [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 employers 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 86% 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 final 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 estimated 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 summarize employer characteristics and experiences employing an adult with
Employers' perception of the costs and the benefits of hiring individuals with autism spectrum disorder in open employment in Australia

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:

\[
\text{Cost (S$AUS) = (hourly wage) \times (hours of work) \times (1 - r boilside proportion) + (cost of weekly supervision)}
\]

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 (HRE2015) 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.**

<table>
<thead>
<tr>
<th>Factors</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of employees with ASD in the organisation(^1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>29</td>
<td>54.7</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>11.3</td>
</tr>
<tr>
<td>3–5</td>
<td>11</td>
<td>20.6</td>
</tr>
<tr>
<td>&gt;6</td>
<td>7</td>
<td>13.2</td>
</tr>
<tr>
<td>Organisations previously employing adult with ASD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>27</td>
<td>60.0</td>
</tr>
<tr>
<td>No</td>
<td>18</td>
<td>40.0</td>
</tr>
<tr>
<td>Number of years employing adult with ASD(^2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1</td>
<td>7</td>
<td>13.2</td>
</tr>
<tr>
<td>1–3</td>
<td>12</td>
<td>23.2</td>
</tr>
<tr>
<td>4–5</td>
<td>16</td>
<td>32.2</td>
</tr>
<tr>
<td>&gt;9</td>
<td>13</td>
<td>26.5</td>
</tr>
<tr>
<td>Organisations recruiting employee with ASD through a disability provider(^3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>21</td>
<td>51.0</td>
</tr>
<tr>
<td>No</td>
<td>25</td>
<td>49.0</td>
</tr>
</tbody>
</table>

\(^1\) Excludes missing cases

https://doi.org/10.1371/journal.pone.0177362
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., NDIS 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 3), particularly in regard to increasing awareness of ASD, and in promoting a culture of inclusion. Employees with ASD also contributed new creative and diverse 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.

Employee 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. Employers 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.

<table>
<thead>
<tr>
<th>Reasons</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employer contacted by an agency</td>
<td>19</td>
<td>32.2</td>
</tr>
<tr>
<td>Organisational policy of non-racial non-sex discrimination</td>
<td>17</td>
<td>27.1</td>
</tr>
<tr>
<td>Best candidate for the job at interview</td>
<td>9</td>
<td>15.3</td>
</tr>
<tr>
<td>Previously known to the employer</td>
<td>7</td>
<td>11.9</td>
</tr>
<tr>
<td>Employed with ASD approached the employer directly</td>
<td>7</td>
<td>11.9</td>
</tr>
<tr>
<td>Family inquiry made directly to employer</td>
<td>6</td>
<td>10.2</td>
</tr>
<tr>
<td>Other reasons</td>
<td>22</td>
<td>37.3</td>
</tr>
</tbody>
</table>

*Multiple responses allowed

https://doi.org/10.1371/journal.pone.0177067.t003
Table 4. Interaction between the employee with ASD and co-workers.

<table>
<thead>
<tr>
<th>Type of interaction</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friendly mixed exchanges of both work and out of work conversations</td>
<td>33</td>
<td>55.9</td>
</tr>
<tr>
<td>Employees only interact with a low of the other workers</td>
<td>12</td>
<td>20.3</td>
</tr>
<tr>
<td>Bully work-related conversations between workers</td>
<td>7</td>
<td>11.9</td>
</tr>
<tr>
<td>Restricted to greetings between workers</td>
<td>7</td>
<td>11.9</td>
</tr>
<tr>
<td>Employees struggles with interaction with other workers</td>
<td>11</td>
<td>18.6</td>
</tr>
<tr>
<td>Not accountable</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

*Multiple responses allowed

https://doi.org/10.1371/journal.pone.0177967.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 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.

<table>
<thead>
<tr>
<th>Impact*</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased awareness regarding people with ASD in the workplace</td>
<td>36</td>
<td>59.3</td>
</tr>
<tr>
<td>Positive adaption in workplace culture to include and make the employee with autism feel part of the team</td>
<td>33</td>
<td>55.9</td>
</tr>
<tr>
<td>New creative and different skills have been brought to the workplace</td>
<td>19</td>
<td>32.2</td>
</tr>
<tr>
<td>Improvements in workplace morale</td>
<td>14</td>
<td>23.7</td>
</tr>
<tr>
<td>Lack of ASD-specific knowledge often leads to miscommunication between colleagues</td>
<td>7</td>
<td>11.9</td>
</tr>
<tr>
<td>Need for continuous workplace supervision of this employee has increased workload for other staff</td>
<td>10</td>
<td>16.9</td>
</tr>
<tr>
<td>Lack of ASD-specific staff training has resulted in an increase in workplace conflict between colleagues</td>
<td>5</td>
<td>8.5</td>
</tr>
<tr>
<td>Decreased productivity by the team</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Other impacts</td>
<td>8</td>
<td>13.6</td>
</tr>
<tr>
<td>Not applicable</td>
<td>2</td>
<td>3.4</td>
</tr>
</tbody>
</table>

*Multiple responses allowed

https://doi.org/10.1371/journal.pone.0177967.t005
Table 6. Employer opinions on employing an adult with ASD.

<table>
<thead>
<tr>
<th>Factors</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employers who would recommend employing an employee with ASD</td>
<td>Yes</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Possibly</td>
<td>18</td>
</tr>
<tr>
<td>Replacement of employees with ASD if this person left the workplace</td>
<td>Casual worker with ASD</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Worker without ASD</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Would not be replaced</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Not sure</td>
<td>18</td>
</tr>
</tbody>
</table>

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 $1.45). 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.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Standard of work</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Above n(%)²</td>
<td>Meets n(%)²</td>
<td>Below n(%)²</td>
</tr>
<tr>
<td>Flexibility</td>
<td>No ASD</td>
<td>29 (32.2)</td>
<td>59 (61.5)</td>
</tr>
<tr>
<td></td>
<td>ASD</td>
<td>18 (19.6)</td>
<td>27 (29.1)</td>
</tr>
<tr>
<td>Attends to detail</td>
<td>No ASD</td>
<td>18 (19.6)</td>
<td>52 (54.9)</td>
</tr>
<tr>
<td></td>
<td>ASD</td>
<td>28 (31)</td>
<td>19 (20.5)</td>
</tr>
<tr>
<td>Completes work on time</td>
<td>No ASD</td>
<td>19 (37.3)</td>
<td>67 (71)</td>
</tr>
<tr>
<td></td>
<td>ASD</td>
<td>14 (27.5)</td>
<td>30 (56.9)</td>
</tr>
<tr>
<td>Finiteness of instructions</td>
<td>No ASD</td>
<td>29 (32.2)</td>
<td>62 (65.5)</td>
</tr>
<tr>
<td></td>
<td>ASD</td>
<td>14 (27.5)</td>
<td>30 (56.9)</td>
</tr>
<tr>
<td>Work ethic</td>
<td>No ASD</td>
<td>28 (30.1)</td>
<td>58 (62.2)</td>
</tr>
<tr>
<td></td>
<td>ASD</td>
<td>36 (70.6)</td>
<td>12 (23.5)</td>
</tr>
<tr>
<td>Productivity</td>
<td>No ASD</td>
<td>19 (34.6)</td>
<td>62 (62.2)</td>
</tr>
<tr>
<td></td>
<td>ASD</td>
<td>17 (34.6)</td>
<td>26 (52.9)</td>
</tr>
<tr>
<td>Quality of work</td>
<td>No ASD</td>
<td>24 (35.9)</td>
<td>64 (65.8)</td>
</tr>
<tr>
<td></td>
<td>ASD</td>
<td>21 (41.2)</td>
<td>27 (52.9)</td>
</tr>
</tbody>
</table>

¹Excludes missing cases
²Percentages of responses within employee type.

https://dx.doi.org/10.1371/journal.pone.0177689.e007
Table 8. Multinomial regression analysis of employees meeting requirements for good workplace performance.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Employee</th>
<th>Odds ratio</th>
<th>95% confidence interval</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexibility</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below standard</td>
<td>No ASD</td>
<td>1 (reference)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASD</td>
<td>3.82</td>
<td>1.43–10.20</td>
<td>0.0074</td>
</tr>
<tr>
<td>Above standard</td>
<td>No ASD</td>
<td>1 (reference)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASD</td>
<td>0.73</td>
<td>0.32–1.77</td>
<td>0.5145</td>
</tr>
<tr>
<td>Attends to detail</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below standard</td>
<td>No ASD</td>
<td>1 (reference)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASD</td>
<td>1.41</td>
<td>0.41–5.91</td>
<td>0.5945</td>
</tr>
<tr>
<td>Above standard</td>
<td>No ASD</td>
<td>1 (reference)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASD</td>
<td>6.49</td>
<td>2.03–11.98</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Completes work on time</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below standard</td>
<td>No ASD</td>
<td>1 (reference)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASD</td>
<td>3.19</td>
<td>1.05–9.74</td>
<td>0.0417</td>
</tr>
<tr>
<td>Above standard</td>
<td>No ASD</td>
<td>1 (reference)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASD</td>
<td>2.65</td>
<td>1.21–5.90</td>
<td>0.0145</td>
</tr>
<tr>
<td>Follows instructions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below standard</td>
<td>No ASD</td>
<td>1 (reference)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASD</td>
<td>3.62</td>
<td>0.99–13.32</td>
<td>0.0532</td>
</tr>
<tr>
<td>Above standard</td>
<td>No ASD</td>
<td>1 (reference)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASD</td>
<td>1.63</td>
<td>0.48–2.24</td>
<td>0.8340</td>
</tr>
<tr>
<td>Work ethic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below standard</td>
<td>No ASD</td>
<td>1 (reference)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASD</td>
<td>2.07</td>
<td>0.47–9.18</td>
<td>0.3926</td>
</tr>
<tr>
<td>Above standard</td>
<td>No ASD</td>
<td>1 (reference)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASD</td>
<td>0.21</td>
<td>2.81–13.75</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Productivity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below standard</td>
<td>No ASD</td>
<td>1 (reference)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASD</td>
<td>2.12</td>
<td>0.70–6.45</td>
<td>0.1853</td>
</tr>
<tr>
<td>Above standard</td>
<td>No ASD</td>
<td>1 (reference)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASD</td>
<td>1.79</td>
<td>0.82–3.89</td>
<td>0.1409</td>
</tr>
<tr>
<td>Quality of work</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below standard</td>
<td>No ASD</td>
<td>1 (reference)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASD</td>
<td>1.42</td>
<td>0.32–6.38</td>
<td>0.6452</td>
</tr>
<tr>
<td>Above standard</td>
<td>No ASD</td>
<td>1 (reference)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASD</td>
<td>2.07</td>
<td>0.99–4.34</td>
<td>0.0528</td>
</tr>
</tbody>
</table>

*Proportional odds not assumed

https://doi.org/10.1371/journal.pone.0172967.G008

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 unemployment
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, 30]. 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>
<thead>
<tr>
<th>Variable</th>
<th>No ASD</th>
<th>ASD</th>
<th>Total</th>
<th>Tests of association</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work basis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full time (FT)</td>
<td>42 (72.2)</td>
<td>14 (28.0)</td>
<td>56</td>
<td>( p = 0.044 )</td>
</tr>
<tr>
<td>Part-time (PT)</td>
<td>21 (23.6)</td>
<td>22 (44.0)</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td>Casual</td>
<td>24 (27.0)</td>
<td>12 (24.0)</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>Contract</td>
<td>2 (1.2)</td>
<td>2 (4.5)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>7 (7.2)</td>
<td>1 (2.0)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Supervision required</td>
<td></td>
<td></td>
<td></td>
<td>( \chi^2_{(3)} = 3.3; p = 0.0580 )</td>
</tr>
<tr>
<td>Yes</td>
<td>47 (49.0)</td>
<td>33 (64.7)</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>48 (51.0)</td>
<td>18 (35.3)</td>
<td>66</td>
<td></td>
</tr>
<tr>
<td>Modifications required</td>
<td></td>
<td></td>
<td></td>
<td>( p = 0.3467 )</td>
</tr>
<tr>
<td>Yes</td>
<td>7 (7.3)</td>
<td>6 (11.8)</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>89 (92.7)</td>
<td>45 (88.2)</td>
<td>134</td>
<td></td>
</tr>
<tr>
<td>Training required</td>
<td></td>
<td></td>
<td></td>
<td>( \chi^2_{(1)} = 1.2; p = 0.2659 )</td>
</tr>
<tr>
<td>Yes</td>
<td>53 (55.2)</td>
<td>33 (64.7)</td>
<td>86</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>43 (44.8)</td>
<td>18 (35.3)</td>
<td>61</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\)\text{p-value calculated using Fisher's Exact test}

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

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>95% confidence interval</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hourly wage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No ASD</td>
<td>23.49</td>
<td>20.36–26.63</td>
<td>0.0048</td>
</tr>
<tr>
<td>ASD</td>
<td>21.94</td>
<td>18.61–25.07</td>
<td></td>
</tr>
<tr>
<td>Weekly supervision cost</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No ASD</td>
<td>231.23</td>
<td>174.87–287.59</td>
<td>0.3373</td>
</tr>
<tr>
<td>ASD</td>
<td>255.75</td>
<td>198.26–313.26</td>
<td></td>
</tr>
<tr>
<td>Weekly cost (full-time)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No ASD</td>
<td>1033.19</td>
<td>835.41–1229.19</td>
<td>0.8916</td>
</tr>
<tr>
<td>ASD</td>
<td>1023.26</td>
<td>798.02–1348.70</td>
<td></td>
</tr>
<tr>
<td>Weekly cost (part-time)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No ASD</td>
<td>774.04</td>
<td>524.69–923.39</td>
<td>0.4430</td>
</tr>
<tr>
<td>ASD</td>
<td>734.06</td>
<td>503.45–974.68</td>
<td></td>
</tr>
<tr>
<td>Cost of training</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No ASD</td>
<td>175.75</td>
<td>109.21–241.92</td>
<td>0.0382</td>
</tr>
<tr>
<td>ASD</td>
<td>184.21</td>
<td>115.85–251.56</td>
<td></td>
</tr>
</tbody>
</table>

https://doi.org/10.1371/journal.pone.0172682
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, employers with ASD demonstrated above standard workplace performance when compared to their counterparts with regard to increased attendance 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 [32, 33]. While recognizing that challenges associated with employing adults with ASD, such as following instructions, and flexibility and perseverating on work tasks [34], 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, 52]. Would 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 [36].

Favourable employer attitudes toward hiring individuals with disabilities is associated with larger (100+ employees) organizations and previous experience [36, 37]. 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, 38]. 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 DED provider [36]. DED providers assist with recruitment, job placement, accommodations and ongoing support. Collaboration between employers and DED providers has been identified as a key component promoting positive employment outcomes for employees with a disability [33, 35, 59–61]. Fifty percent of respondents in this study were associated with and had recruited employees with ASD through a DED 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 shift in workplace inclusion. A diverse and inclusive workplace where employees feel valued plays a critical role in workplace performance, productivity and job satisfaction of employees with disabilities [62]. Diversity and inclusion is also beneficial to organisational success [60], 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 were 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 employees 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 had been asked to complete the survey. Another explanation may be that 91% of respondents were supported by DES providers and due to the nature of their supportive relationship and the financial assistance provided, may have felt pressurised to respond positively. Thirdly, despite consistent 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/A/A), 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 skill, 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 Sheenam 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

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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


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

<table>
<thead>
<tr>
<th>Perspective</th>
<th>Findings from studies drawing from theoretical constructs of self-efficacy, the ICF framework and the strengths-based approach</th>
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<tr>
<td><strong>Self-efficacy theory</strong></td>
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<tr>
<td>Blackman &amp; Chiveralls, 2011 (41)</td>
<td>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</td>
</tr>
<tr>
<td>Fitzgerald &amp; Schutte, 2010 (42)</td>
<td>Managers assigned to the intervention group were more likely to demonstrate transformational leadership in the workplace following an increase in their self-efficacy</td>
</tr>
<tr>
<td>Wood &amp; Jacobson, 2008 (43)</td>
<td>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</td>
</tr>
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<td><strong>ICF Framework: Environmental factors</strong></td>
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<tr>
<td>Fleming et al., 2009 (44)</td>
<td>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</td>
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<tr>
<td>Foley et al., 2014 (45)</td>
<td>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</td>
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<td>Heinemann et al., 2016 (46)</td>
<td>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</td>
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<td><strong>Strengths-based approach</strong></td>
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</tr>
<tr>
<td>Campbell &amp; Tincani, 2011, (47)</td>
<td>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</td>
</tr>
<tr>
<td>Steiner, 2011, (48)</td>
<td>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</td>
</tr>
</tbody>
</table>
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)](image-url)
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)[69]. 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

<table>
<thead>
<tr>
<th>Environmental factors</th>
<th>Employment-related example</th>
<th>ICF Core Sets for ASD: Category codes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chapter 1: Products and technology</strong></td>
<td>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)</td>
<td>e125; e130</td>
</tr>
<tr>
<td><strong>Chapter 2: Natural environment and human-made changes to the environment</strong></td>
<td>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)</td>
<td>e240; e250</td>
</tr>
<tr>
<td><strong>Chapter 3: Support and relationships</strong></td>
<td>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)</td>
<td>e325; e330; e360</td>
</tr>
<tr>
<td><strong>Chapter 4: Attitudes</strong></td>
<td>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)</td>
<td>e430; e455; e460</td>
</tr>
<tr>
<td><strong>Chapter 5: Services, systems and policies</strong></td>
<td>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)</td>
<td>e590</td>
</tr>
</tbody>
</table>

**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).
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

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.


Chapter 6: Paper V-Protocol and Pilot study: Development of the IEST™
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.

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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.

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This publication can instead be accessed via:
https://www.springer.com/psychology/child+%26+school+psychology/journal/10803
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.

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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 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 a 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 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\textsuperscript{TM} 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\textsuperscript{TM} is required. The use of an online web-based application will increase the accessibility of the IEST\textsuperscript{TM}, 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\textsuperscript{TM} 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\textsuperscript{TM} 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\textsuperscript{TM} 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\textsuperscript{TM}, 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\textsuperscript{TM} 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 pressurised 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.”
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Thesis Reference List

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.
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

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, 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-events]. 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 1)
   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 H14/252/2014). The Committee is comprised of members of the public, academics, lawyers, doctors and pastoral care. If needed, verification of approval can be obtained either by writing to the Human Research Ethics Committee, c/- Office of Research and Development, Curtin University, GPO Box J1987, Perth, 6845 or by telephoning 9266 2794 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 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

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Abstract

Background

Despite the 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, PsyINFO, Scopus, and Web of Science. 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.
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 heterogeneous 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, yet 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 [18].

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 fulfill 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 [23]. Despite a need and ambition of individuals with ASD to become employed, there are limited opportunities for competitive employment [16]. This may be attributed to interpersonal 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 a result of these interpersonal 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 [16].

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 [26], 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 [38].

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 [32]. 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: autistic, ASD, ASC, aspergers, “high functioning”,
employ", hiring", job", occup", activity", cost", benefit", economic", cost effectiveness", cost benefit", analysis. When using Boolean operators the following combined search strategy used in review was autism" OR ASD OR ASC OR aspergers" OR "high functioning" AND employ" OR hiring" OR job" occup" 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 [3]. 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 preselected 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 categorized 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 off the titles and abstracts, 2,511 were excluded leaving 86 articles. Dupicates 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 fulfill 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 Mavranzouki, Mognin-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 Gantz (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

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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 £69–£9193; median post-work = £0, range £0–£60801; median reduction = £41974, range £1440 to £69030; Wilcoxon Z = −2.72, 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 approximately 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 services for the government.

Cinera, 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$82,440.60), compared with the group who had not been in sheltered workshops prior to supported employment. This study concluded that individuals with ASD had better occupational 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 Mavronozaki, Meggin-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 £3,660 per quality-adjusted life year or £18 per additional week in employment. These findings agree with those of Cinera 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 £35,607, 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 £32,081, 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

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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 as tudy of the US vocational rehabilitation system during the period of 2002–2006 [48]. It found that during 2002, the cost of providing vocational rehabilitation services to an individual with ASD was $US3,262 per person. In 2006 this decreased to $US2,992 per person. This was in comparison to the costs of providing the same services to the overall vocational rehabilitation population, which increased from $US2,266 to $US2,336 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 $US26.74 for every dollar these individuals earned in wages. In 2006 this ratio decreased to $US19.19. The wider vocational rehabilitation population had cost-wage ratios of $US12.01 and $US9.73 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 ratio for individuals with ASD was 40.85%. The only other areas of disabilities that experienced higher rates of employment were people with learning disabilities (61.84%) 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, compensating 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 ASD's lifetime cost was greater than £2.4 million. The major costs were living support and daily activities. Costs for families represented 3.3% 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.

Gane [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 $US3.2 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. Schallert 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 workplace for a significant period of time.

Cameri 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 = 23.71/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 Cameri (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 [49].

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 Wilmott (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 within 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 [95].

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 subsidies 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)
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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


Appendix C 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?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

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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?

<table>
<thead>
<tr>
<th>Above Standard</th>
<th>Meets Standard</th>
<th>Below Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee A (autism)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Employee B</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Employee C</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

1.9 How would you describe the employee’s attention to detail?

<table>
<thead>
<tr>
<th>Above Standard</th>
<th>Meets Standard</th>
<th>Below Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee A (autism)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Employee B</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Employee C</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

1.10 How often does this employee complete their allocated amount of work on time?

<table>
<thead>
<tr>
<th>Above Standard</th>
<th>Meets Standard</th>
<th>Below Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee A (autism)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Employee B</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Employee C</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

1.11 How would you best describe this employee’s ability to follow instructions?

<table>
<thead>
<tr>
<th>Above Standard</th>
<th>Meets Standard</th>
<th>Below Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee A (autism)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Employee B</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Employee C</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
1.12 How do you feel about leaving this employee to interact with customers?

<table>
<thead>
<tr>
<th></th>
<th>Not Applicable</th>
<th>Completely independent</th>
<th>Interacts with customers, but supervisors are present</th>
<th>Requires some active supervision when dealing with customers</th>
<th>Not confident leaving them alone with customers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee A (autism)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Employee B</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Employee C</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

1.13 This employee’s work ethic is best described as:

<table>
<thead>
<tr>
<th></th>
<th>Above Standard</th>
<th>Meets Standard</th>
<th>Below Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee A (autism)</td>
<td>☐</td>
<td></td>
<td>☐</td>
</tr>
<tr>
<td>Employee B</td>
<td>☐</td>
<td></td>
<td>☐</td>
</tr>
<tr>
<td>Employee C</td>
<td>☐</td>
<td></td>
<td>☐</td>
</tr>
</tbody>
</table>

1.14 Select the description that best describes the productivity of this employee:

<table>
<thead>
<tr>
<th></th>
<th>Above Standard</th>
<th>Meets Standard</th>
<th>Below Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee A (autism)</td>
<td>☐</td>
<td></td>
<td>☐</td>
</tr>
<tr>
<td>Employee B</td>
<td>☐</td>
<td></td>
<td>☐</td>
</tr>
<tr>
<td>Employee C</td>
<td>☐</td>
<td></td>
<td>☐</td>
</tr>
</tbody>
</table>

1.15 Select the description that best describes the typical quality of work done by this employee:

<table>
<thead>
<tr>
<th></th>
<th>Above Standard</th>
<th>Meets Standard</th>
<th>Below Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee A (autism)</td>
<td>☐</td>
<td></td>
<td>☐</td>
</tr>
<tr>
<td>Employee B</td>
<td>☐</td>
<td></td>
<td>☐</td>
</tr>
<tr>
<td>Employee C</td>
<td>☐</td>
<td></td>
<td>☐</td>
</tr>
</tbody>
</table>

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?

<table>
<thead>
<tr>
<th>Full-time</th>
<th>0-5</th>
<th>6-10</th>
<th>11-20</th>
<th>20-100</th>
<th>100+</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Part-time</th>
<th>0-5</th>
<th>6-10</th>
<th>11-20</th>
<th>20-100</th>
<th>100+</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Casual</th>
<th>0-5</th>
<th>6-10</th>
<th>11-20</th>
<th>20-100</th>
<th>100+</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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)?

<table>
<thead>
<tr>
<th>Job Title</th>
<th>Key tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee A (autism):</td>
<td>1.</td>
</tr>
<tr>
<td></td>
<td>2.</td>
</tr>
<tr>
<td></td>
<td>3.</td>
</tr>
<tr>
<td></td>
<td>4.</td>
</tr>
<tr>
<td></td>
<td>5.</td>
</tr>
</tbody>
</table>

| 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?

<table>
<thead>
<tr>
<th></th>
<th>&lt; 6 months</th>
<th>6-12 months</th>
<th>13-18 months</th>
<th>19-24 months</th>
<th>25-30 months</th>
<th>31-36 months</th>
<th>&gt; 36 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee A (autism)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Employee B</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Employee C</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

3.3. On what basis is this employee employed?

<table>
<thead>
<tr>
<th></th>
<th>Full-time</th>
<th>Part-time</th>
<th>Casual</th>
<th>Contract</th>
<th>Trial/Probation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee A (autism)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Employee B</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Employee C</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>
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?

<table>
<thead>
<tr>
<th>1-5%</th>
<th>6-10%</th>
<th>11-20%</th>
<th>21-40%</th>
<th>41-60%</th>
<th>61-70%</th>
<th>71-90%</th>
<th>I do not know</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

Employee A (autism)

3.6. Please specify to whom the chosen three employees report:

<table>
<thead>
<tr>
<th>Supervisor</th>
<th>Manager</th>
<th>Peer</th>
<th>Business owner</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

Employee A (autism)

| ☐          | ☐       | ☐    | ☐              | ☐     |

Employee B

| ☐          | ☐       | ☐    | ☐              | ☐     |

Employee C

3.7 What is the average hours worked by the employee per week (excluding overtime)?

<table>
<thead>
<tr>
<th>&lt;10</th>
<th>11-15</th>
<th>16-20</th>
<th>21-25</th>
<th>26-30</th>
<th>31-35</th>
<th>&gt;35</th>
<th>I do not know</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

Employee A (autism)

| ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

Employee B

| ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

Employee C

| ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
3.8. What is the employee's approximate hourly rate of pay?

<table>
<thead>
<tr>
<th>Rate Range</th>
<th>$1-5</th>
<th>$6-10</th>
<th>$11-20</th>
<th>$21-30</th>
<th>$31-40</th>
<th>$41-50</th>
<th>$51-60</th>
<th>$61+</th>
<th>I do not know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee A (autism)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Employee B</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Employee C</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

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)?

<table>
<thead>
<tr>
<th>Overtime Hours</th>
<th>0</th>
<th>1-5</th>
<th>6-10</th>
<th>11-15</th>
<th>16-20+</th>
<th>I do not know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee A (autism)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Employee B</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Employee C</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

3.10. What is the employee's approximate hourly rate of overtime pay?

<table>
<thead>
<tr>
<th>Overtime Rate</th>
<th>$10-30</th>
<th>$31-50</th>
<th>$51-70</th>
<th>$71-90</th>
<th>$91-100</th>
<th>$110</th>
<th>I do not know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee A (autism)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Employee B</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Employee C</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

3.11. Was there any additional training/staff development required for this worker once they started work?

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>I do not know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee A (autism)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Employee B</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Employee C</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
3.12. What type of additional training/staff development was required? (Multiple options allowed)

<table>
<thead>
<tr>
<th>Customer Service</th>
<th>Role specific skill re-enforcement/enhancement</th>
<th>Computer training</th>
<th>Conflict resolution</th>
<th>Behaviour management</th>
<th>Safety procedures</th>
<th>Sales strategies</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee A (autism)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Employee B</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Employee C</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

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?

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1-3</th>
<th>4-6</th>
<th>7-9</th>
<th>10-13</th>
<th>14-16</th>
<th>16+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee A (autism)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Employee B</td>
<td>☐</td>
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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?

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>I do not know</th>
</tr>
</thead>
<tbody>
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</table>

Employee A (autism)

Employee B

Employee C

4.2. Number of workers’ compensation claims because of injuries (yearly):

<table>
<thead>
<tr>
<th>0</th>
<th>1-2</th>
<th>3-4</th>
<th>5-6</th>
<th>6+</th>
<th>Not Applicable</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

Employee A (autism)

Employee B

Employee C

4.3. Have any changes to the workplace (e.g., facilities) or job procedures been made for employees (Multiple options allowed)?

<table>
<thead>
<tr>
<th>Ramps</th>
<th>Rails</th>
<th>Desks &amp; Seating</th>
<th>Computer Adjustment</th>
<th>Lighting</th>
<th>Noise/ Sound proofing</th>
<th>Barrier isolation spaces</th>
<th>Equipment Adjustment</th>
<th>Matting Flooring</th>
<th>Other</th>
<th>None</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

Employee A (autism)

Employee B

Employee C

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:

<table>
<thead>
<tr>
<th></th>
<th>&lt;$500</th>
<th>$501-$1000</th>
<th>$1001-$2000</th>
<th>$2001-$5000</th>
<th>$5001-$10,000</th>
<th>&gt; $10,000</th>
<th>I do not know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee A (autism)</td>
<td>☐</td>
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<tr>
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</tbody>
</table>

4.6. Has this employee over the previous year had an unscheduled absence? For example, medical, parental, bereavement, relocation, separation, or legal?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>I do not know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee A (autism)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>Employee B</td>
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<tr>
<td>Employee C</td>
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</tbody>
</table>

4.7. How many unscheduled absences occurred over the previous six months?

<table>
<thead>
<tr>
<th></th>
<th>1-2 days</th>
<th>3-4 days</th>
<th>5-6 days</th>
<th>6+ days</th>
<th>Not Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee A (autism)</td>
<td>☐</td>
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</tbody>
</table>

4.8. Average amount of supervision required for each employee per week:

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1-4 hours</th>
<th>5-8 hours</th>
<th>9-12 hours</th>
<th>13-30 hours</th>
<th>31-50 hours</th>
<th>51+ hours</th>
<th>Not Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee A (autism)</td>
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</table>

4.9. At your organisation approximately for how long has this employee with autism been employed?

<table>
<thead>
<tr>
<th></th>
<th>&gt; 36 months</th>
<th>31-36 months</th>
<th>25-30 months</th>
<th>19-24 months</th>
<th>13-18 months</th>
<th>7-12 months</th>
<th>&lt; 6 months</th>
</tr>
</thead>
<tbody>
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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 D Information sheet informing the Employer Survey
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 E The Integrated Employment Success Tool (IEST™)

Due to Intellectual Property obligations, claims or restrictions imposed by an external organisation 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™.