School of Occupational Therapy, Social Work, and Speech Pathology

The Development and Evaluation of a Strength-based Technology Club for Adolescents with Autism Spectrum Disorder

Matthew Jones

0000-0001-6253-5084

This thesis is presented for the Degree of

Doctor of Philosophy

of

Curtin University

March 2021

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 HRE2017-0147-04 (Appendix A).

Signature:

Date: 24th March 2021

Acknowledgments

Firstly, I would like to acknowledge all the autistic individuals, parents, and facilitators who not only participated in this study but created a space where autistic adolescents belonged. It is truly gratifying to witness autistic adolescents develop genuine friendships through a passion for technology. This study provided the spark to start a technology club; however, it was the persistence of parents and facilitators who created a long-term community resource freely available to autistic adolescents. To have helped create a space where autistic adolescents can ‘nerd out’ will forever be one of my proudest moments as an Occupational Therapist.

To my supervision team, Sonya Girdler, Marita Falkmer, Ben Milbourn, Tele Tan, and Sven Bölte thank you for your guidance, support, and laughter.

To Sonya, I am so glad that you will no longer have to read my work while on holiday! Now you just need to help all those other Ph.D. students finish, and you can finally take a proper break. Your commitment to the autistic community and your research family is both inspiring and exhausting. While we have had heated debates, I respect everything you have achieved and know that it did not come easily. Every research project you touch impacts the lives of autistic individuals and is not merely a mechanism to pad your resume or justify promotion. I will miss our weekly supervision meetings apart from the “this needs to be done by close-of-business Friday” conversations. Lastly, thanks for embracing who I am as an individual. You always took an interest in my ambitions and incorporated my strengths into research; I guess you could say you applied a strength-based approach to my supervision.

To Marita, I will miss your calming presence. You were always there to balance Sonya’s enthusiasm with reality, and when “this really needs to be done by

close-of-business Friday” happened, you were there to help. You always embraced technology even though it was not familiar to you and made autistic adolescents feel comfortable through your genuine respect for their interests. Your kind personality, open-mindedness, and creativity were invaluable to my Ph.D. journey and creating technology clubs for autistic adolescents. Enjoy retirement.

To Ben, thank you for providing your family experience with autism to this research project. I am glad that you were involved in creating something that can assist future generations of autistic individuals. You provided a space for me to ‘nerd out,’ a moment to talk about movies, podcasts, or Star Wars while Sonya ran from her last meeting or journeyed to the office printer.

To Tele, you were the spark that created an amazing collaboration between Occupational Therapy and Engineering. I genuinely believe that when engineers and therapists work together, massive leaps in health provision are made. You did more than create strength-based technology clubs; you created a neurodiverse movement within Western Australia which ripples through education and employment. You leveraged your networks to provide education and employment opportunities to autistic youth who otherwise would have been forgotten or ignored. You started a program that was sorely missing from autism service providers, and your impact on the autistic community would make any therapist jealous.

To Sven, thank you for guiding this project with all your research experience and expertise. You would always be able to see the ‘big picture’ and identify how a study could be improved. Despite having limited time and numerous other responsibilities, you always quickly responded to my emails to share your knowledge. Your calm yet confident approach to conference presentations (and tricky questions from the audience) is a pleasure to watch.

Despite the uncertainty in the world right now, I know that this supervision team will continue to impact the lives of autistic individuals through practical research.

Finally, to my parents. I am forever thankful for the support you provided Chris and I. You nurtured my creativity and always encouraged me to seize opportunities. I am incredibly privileged to be in this position, and it is all thanks to the home you created. Dad, I like to think that I inherited some of your engineering mind, which has helped me combine health and technology. Mum, I cannot believe that you achieved your doctorate when Chris and I were young, demanding children!

Dedication

In memory of Alan.

Most fathers are hostile towards future son-in-laws, but you never were. You welcomed me to your family, and we bonded over your love for computers. I am only now realizing that we exhibited the same results as this study, a friendship built upon common interest. You respected my business aspirations and always tried to assist me whenever you could. Your generosity, kindness, and fierceness were, without a doubt, passed onto your daughter. Without Danni, I could not have completed this thesis. She was there to provide many hugs, delicious food, and forced rest breaks. She inspires me every day with what she has achieved in policy development, and her work has already impacted the lives of many Australians.

I will continue to love and care for your daughter, as she has for me over these many years of study.

Statement of Contributions

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

Matthew Jones (Candidate)	22nd March 2021
Professor Sonya Girdler	22nd March 2021
Dr Marita Falkmer	22nd March 2021
Dr Ben Milbourn	22nd March 2021
Professor Tele Tan	22nd March 2021
Professor Sven Bölte	22nd March 2021

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

Abstract

Transitioning from adolescence to adulthood is daunting for everyone and even more so for autistic adolescents who face poor adulthood outcomes. Autistic adults experience higher unemployment levels than those with other disabilities or no disability, have low participation in postsecondary education, are disconnected from community activities, and are likely to be socially isolated. In response to poor adulthood outcomes, there is an increased need for adolescent transition services that focus on improving employment, education, and community integration outcomes. Interventions aimed at preparing autistic adolescents for adulthood should provide individualized learning opportunities, offer a wide range of skill development (career development skills, self-determination skills, and recreation skills), and strengthen supportive relationships with family, peers, and community. Interventions for autistic adolescents are currently focused on developing social skills or improving challenging behavior (e.g., self-injurious, aggressive, off-task). While these are important for transitioning into adulthood, it neglects other aspects of positive adolescent development. There is an opportunity for transition interventions for adolescents with a disability to go beyond remediating deficits and apply an individualized strength-based approach.

Technology clubs have been suggested as a possible intervention for improving autistic adolescents' outcomes, given their focus on strengths and developing positive traits. Multiple factors have driven the focus on technology-based activities for autistic adolescents. Some of the strengths identified in autistic individuals, such as attention to detail and mathematical abilities, align with skills and tasks in the Information and Communication Technology (ICT) sector. The potential for autistic individuals to excel within the ICT sector has led to multiple global specialized employment programs that aim to match autistic strengths with work tasks. Despite low participation in tertiary education, when autistic youth choose to enroll in tertiary studies, they are more likely to choose science,

technology, engineering, and mathematics (STEM) career paths, and specifically major in computer science compared with other disability groups. Finally, parents of autistic adolescents report technology-based tasks are highly motivating and engaging for their children. Considering the potential match in autistic strengths and technology-based tasks, further investigation into the benefits of strength-based technology clubs is warranted.

Strength-based technology clubs for autistic adolescents have been investigated within the literature, exploring various outcomes, including emotional well-being, skill development, and social participation. While multiple examples of strength-based technology clubs exist, there is no standardized approach or framework for designing and delivering technology clubs to autistic adolescents. The lack of standard intervention delivery impacts the ability to replicate strength-based technology clubs and test their efficacy in improving outcomes for autistic adolescents. Therefore, this thesis aimed to develop and evaluate a strength-based technology club for autistic adolescents using a newly developed framework. The research was guided by the Medical Research Council (MRC) Framework for developing and evaluating complex interventions and was undertaken as five studies:

Study One completed a systematic review to identify the active ingredients of strength-based technology clubs. Active ingredients are the unique aspects of an intervention that lead to change. Developing a clear understanding of active ingredients allows interventions to be replicated, as service providers can ensure they employ similar strategies when delivering interventions. Electronic databases were searched, resulting in nine studies that met the selection criteria. Qualitative analysis revealed three active ingredients that appeared in the literature: mutual respect between facilitators and autistic adolescents, opportunities for autistic adolescents to demonstrate their skills, and leveraging

focused interests. The results contributed to developing a strength-based technology club framework for autistic adolescents.

Study Two aimed to further identify the active ingredients of strength-based technology clubs by performing a realist evaluation of current technology clubs in the community. While the systematic review in Study One provided insight into the active ingredients of previous clubs, it was not possible to capture all components by reviewing available literature. Study Two employed an ethnographic approach by observing three different strength-based technology clubs within the community and interviewing 23 adolescents, 25 parents, and 20 facilitators to identify the active ingredients of these programs. Thematic analysis revealed three active ingredients: activity design, strengths and abilities, and the environment. The relationship between these three active ingredients, also referred to as mechanisms, was mapped to context and outcome themes. This study contributed to the thesis by providing insight into the active ingredients through ethnographic methods.

Study Three developed an evidence-based framework to guide future strength-based technology clubs' design and delivery by synthesizing Study One and Study Two results. The synthesized list of active ingredients was compared to existing adolescent health theories to create a new framework. The framework presented four components represented by the acronym IVAR: interests, value, autonomy, and requirements. Interests referred to employing strategies leveraging the special interest of autistic adolescents, value referred to implementing strategies that value the individual strengths and abilities of each student, autonomy referred to strategies that encourage choice and decision making, and requirements referred to strategies that address the physical and social environment needs of autistic adolescents. Guided by the newly developed framework, practical recommendations for designing and delivering a strength-based technology club were developed.

Study Four applied the newly developed framework in establishing a strength-based technology club and then assessing its feasibility. The entire process of creating a technology club embedded in the community was achieved. An information and recruitment day was held in the community, funding was obtained to purchase the resources necessary in delivering the technology club, a local secondary school donated classroom space, and volunteer facilitators were recruited from the community. Autistic adolescents (*n* = 25) participated in the technology club for 15-weeks, which consisted of a holiday program followed by weekly Saturday sessions. The feasibility of the club was assessed via qualitative and quantitative methods. Focus groups and interviews were conducted with adolescents, parents, and facilitators separately to provide insight into other feasibility aspects. Adolescents and parents completed pre-test post-test measures to provide quantitative data on preliminary efficacy. Based on the findings, recommendations for improving the feasibility of future clubs were made.

Study Five undertook a 12-month review of the strength-based technology club. From the current project's inception, it was intended that the strength-based technology club would extend beyond the research project, being sustained and led by the local community. Following the 15-week program evaluated in Study Four, a community team of volunteers was selected to organize and continue the technology club. To date, the strength-based technology club has continued for over 12 months, coordinated entirely by volunteers in the community. Study Five undertook separate interviews with facilitators (*n* = 3), parents (*n* = 2), and a university coordinator (*n* = 1) with the goal of understanding those factors impacting the club's sustainability and longevity. Qualitative analysis revealed three themes that supported the long-term success of the technology club: club champions, expert facilitators, and collaborative partnerships. Challenges with adhering to the IVAR framework were also explored. The 12-month review

provided valuable insights into factors impacting the implementation and continuation of strength-based technology clubs for autistic adolescents.

This thesis is highly specific to technology and while the autistic participants display a genuine interest in technology with technology-related strengths, this does not represent the entirety of the autistic population. The recommendations provided should be considered as an example of how to apply strength-based strategies to intervention programs. The recommendations have been applied within the context of a technology club; however, it is hoped that the program will be adapted to other interest areas in the future based on other strengths. For example, creative and artistic skills have also been suggested as a strength of autistic individuals providing an opportunity to explore other interest areas such as artwork, music, fictional writing or creating media. The context of the researchers also contributed to the specific focus on technology clubs. Within Western Australia, multiple autism service providers had introduced technology clubs for autistic adolescents which had gain popularity, despite a lack of supporting literature. Further, the researcher’s university department, occupational therapy, had ongoing collaborations with engineering departments, providing a unique opportunity to combine health and technology. This context contributed to developing and evaluating technology clubs. The general discussion of this thesis will provide further insight into how the results can be applied to areas outside of technology-based programs.

Overall, this thesis's findings contribute new knowledge in articulating an evidence-based framework for underpinning the design and delivery of future strength-based technology clubs for autistic adolescents. While strength-based technology clubs appear to be a promising approach in improving outcomes for autistic individuals, the varied strategies adopted in implementing these programs have impacted opportunities for more rigorous testing. Future research can now utilize the proposed framework in undertaking randomized

controlled trial evaluations to test the efficacy of strength-based technology clubs' in improving outcomes for autistic adolescents. Efficacy testing should extend beyond social and behavioral outcomes and consider measuring the development of positive adolescent traits. The IVAR framework was designed specifically for technology clubs; however, the focus on interests, values, autonomy, and requirements may apply to other autism interventions. Future research should consider how the IVAR framework can be applied in delivering a strength-based approach to other activities.

Table of Contents

List of Figures

List of Tables

List of Appendices

List of Abbreviations

AASPIRE	Academic Autistic Spectrum Partnership in Research and Education
AASQA	Autism Academy of Software Quality Assurance
ADHD	Attention deficit hyperactivity disorder
ADOS	Autism Diagnostic Observation Scale
AIR	American Institutes for Research
ASD	Autism spectrum disorder
ATAR	Australian Tertiary Admission Rank
AUD	Australian Dollar
CMC	Computer-mediated communication
CMO	Context-mechanism-outcome
CSIE	Circumplex Scales of Interpersonal Efficacy
DSM-5	Diagnostic and Statistical Manual of Mental Disorders, 5th Edition
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition
ES	Effect size
GSE	General Self-efficacy Scale
ICF – CY	International Classification of Functioning, Disability and Health – Children and Youth Version
ICP	Interactive computer play
ICT	Information and Communication Technology
IDEA	Individuals with Disabilities Education Act
INSAR	International society for autism research
IQ	Intelligence quotient

IVAR	Interest, value, autonomy, and requirements
MeSH	Medical Subject Headings
MRC	Medical Research Council
NDIS	National Disability Insurance Scheme
PALS	Perth A-Loneliness Scale
PDD-NOS	Pervasive developmental disorder not otherwise specified
PedsQL	Pediatric Quality of Life Inventory
PERMA	Positive emotion, engagement, relationships, meaning and accomplishment
RCT	Randomized control trial
SDT	Self-determination Theory
SPSS	Statistical Package for Social Sciences
SRS-2	Social Responsiveness Scale – Second Edition
STEM	Science, technology, engineering, and mathematics
STEM-CIS	Science, Technology, Engineering and Mathematics Career Interest Survey
TAFE	Technical and Further Education
UCLA	University of California, Los Angeles

List of Publications

Published

Jones M, Falkmer M, Milbourn B, Tan T, Bölte S, Girdler S. Identifying the essential components of strength-based technology clubs for adolescents with autism spectrum disorder. Dev Neurorehabil [Internet]. 2021 Mar 8 [cited 2021 Mar 25];1–15. Available from: https://www.tandfonline.com/doi/full/10.1080/17518423.2021.1886192. DOI:10.1080/17518423.2021.1886192

Submitted (considered for publication following revisions)

Jones M, Falkmer M, Milbourn B, Tan T, Bölte S, Girdler S. The core elements of strength-based technology programs for autistic youth: A systematic review of qualitative evidence. Rev J Autism Dev Disord. Forthcoming 2021

Submitted (awaiting review)

Jones M, Falkmer M, Milbourn B, Tele T, Bölte S, Girdler S. A practical framework for delivering strength-based technology clubs for adolescents with autism spectrum disorder. Forthcoming 2021

Jones M, Falkmer M, Milbourn B, Tan T, Bölte S, Girdler S. Strength-based technology clubs for autistic adolescents: A feasibility study. Forthcoming 2021

Jones M, Falkmer M, Milbourn B, Tan T, Bölte S, Girdler S. Factors influencing the sustainability of a strength-based technology club: A case study. Forthcoming 2021

List of conference presentations

Panel Presentation

Jones M, Falkmer M, Milbourn B, Tan T, Bölte S, Girdler S. Strength-based programs for individuals with autism spectrum disorder: A scoping review defining the active ingredients. International Society for Autism Research (INSAR); 2018 May 9-12; Rotterdam, Netherlands.

Jones M, Falkmer M, Milbourn B, Tan T, Bölte S, Girdler S. Strength-based computer coding groups for adolescents with ASD: A realist evaluation. International Society for Autism Research (INSAR); 2018 May 9-12; Rotterdam, Netherlands.

Oral Presentation

Jones M, Falkmer M, Milbourn B, Tan T, Bölte S, Girdler S. The development and evaluation of a strength-based extracurricular STEM program for adolescents with ASD. Autism West Symposium; 2017 November 3-4; Perth, Australia.

Chapter 1: Introduction

Background

Private and not-for-profit organizations funded portions of this research, enabling the delivery of strength-based technology clubs to autistic adolescents free of charge. The services provided were made available to autistic adolescents within the Perth metropolitan and regional areas of Western Australia. The contributions of each funding body are acknowledged in the relevant chapters.

This thesis's overarching approach was guided by implementation science (1). Implementation science aims to address the evidence-to-practice gap, where research fails to consider or address barriers to implementing recommendations into practice (2). This research provided the funding and knowledge needed to start a strength-based technology club; however, the club continued beyond the research team’s involvement drawing on community volunteers. In closing the evidence-to-practice gap, the research team trained a group of community volunteers to independently operate the strength-based technology club beyond the research project.

The language used to refer to autistic adolescents and their families vary throughout the chapters, as each chapter has been submitted to a different journal. Depending on the preferred terminology of the journal, the diagnostic language may differ. Where possible, the term ‘autistic’ has been used to better align with the viewpoints of the autistic community (3). The term ‘autistic’ is well aligned with the thesis's strength-based approach because it acknowledges the importance of autistic identity, encourages neurodiverse thinking, and emphasizes strengths over deficits (3). Inconsistencies may also exist between chapters regarding general spelling, primarily differences between Australian and United States of America spelling conventions.

Autism

To receive a diagnosis of autism spectrum disorder (ASD), according to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) (4), a person needs to demonstrate significant and persistent deficits in social communication and restricted and repetitive patterns of behavior. The DSM-5 replaced the previous diagnosis subcategories of autistic disorder, Asperger's Syndrome, and pervasive developmental disorder not otherwise specified (PDD-NOS) with the single diagnostic term of ASD (4). While the ASD subcategories no longer exist under the DSM-5, some participants within this thesis received their diagnosis under the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) and reported their diagnosis as Asperger's Syndrome or PDD-NOS. The DSM-IV subcategories of ASD have been included in sociodemographic data to provide context on the individual's diagnosis.

The latest Australian data showed 205 200 individuals diagnosed with ASD, representing a 25.1% increase in prevalence since 2015 (5). Males were more commonly diagnosed with ASD than females, with the highest prevalence between 10 to 14 years old (5). While multiple factors contributed to the prevalence spike in ASD, the data indicates a clear need for services to match the increased number of autistic adolescents (5). The urgency for autism services targeting adolescents is magnified by the continued poor outcomes experienced in adulthood (6).

Outcomes for autistic adults

Autistic adults experience poor outcomes across a range of life areas, including employment (7–10), community participation (11), postsecondary education (12), and peer relationships (13). In Australia, the unemployment rate for autistic individuals is 34.1%, a rate three times greater than all people with a disability (10.3%) and seven times greater than people without disability (4.6%) (5). Poor vocational outcomes for autistic individuals are reflected internationally. A

national survey of young autistic Americans showed about half (53.4%) had never worked for payment outside of their home, and those who did had significantly lower wages than other disability groups (9). Further, autistic individuals without an intellectual disability are three times more likely to have no activities outside of the home than autistic individuals with an intellectual disability (10).

Community participation declines as autistic adolescents transition into adulthood and is often linked with the removal of school support structures (11). The resources provided by a school in delivering extracurricular activities, sports, and clubs abruptly end after exiting the school system (11). Factors associated with higher community participation for autistic individuals post-school include higher family income and access to case management, suggesting external factors can significantly influence community participation (11).

Poor postsecondary education outcomes are an international concern for autistic adults (12,14). The National Longitudinal Transition Study 2 (NLTS2) based in the United States, collected data from 680 autistic youth from the ages of 13-16 years old (12). Data taken after six years showed that, since leaving secondary school, 9.3% of autistic youth had participated in vocational/technical education, 28% had participated in 2-year college, 12.1% had participated in 4-year college. Compared with speech/language impairment and learning disability, autistic youth had lower participation in all postsecondary education categories (i.e. vocational/technical education, 2-year college, and 4-year college). Further, 34.9% of autistic youth had no participation in any postsecondary education or employment. Comparatively, 7.4% of speech/language impairment participants and 3% of learning disability participants had no participation in postsecondary education or employment (12). Similarly, in Australia, autistic individuals are less likely to complete tertiary education than all people with a disability or without

disability (5). Further, a smaller Australian study of 73 autistic adults found that over half (57.9%) who had completed postsecondary degrees were either underemployed or unemployed over 12 years (14). While the sample size is small, it does raise concern for employment for autistic individuals even after successfully completing tertiary education.

Autistic adults also experience poor social outcomes. Compared to intellectual disability, emotional/behavioral disability, and learning disability, autistic individuals were more likely to be socially isolated, never see friends, speak to friends, or be invited to friends' activities (15). An earlier longitudinal study found that only 8.1% of 235 autistic adolescents and adults participated in a non-prearranged activity with a same-aged friend (13).

To improve the outcomes for autistic adults, multi-faceted adolescent transitional services that focus on employment, education, and community integration are needed (16,17). Transition services consider a range of approaches such as the person-environment fit, integrated and collaborative services, and leveraging individual strengths (17). Currently, interventions for autistic adolescents are focused on social and behavioral deficits identified by the ASD diagnostic criteria (18–20), potentially neglecting the development of other skills needed for adulthood, such as self-determination, vocational skills, community participation, and self-care (16). To understand what skills are needed for positive transition into adulthood, transition service literature is explored.

Intervention focus for autistic adolescents

A systematic review of interventions for autistic adolescents revealed that 62% of all identified intervention research targeted social skills or challenging behavior (e.g. self-injurious, aggressive, or stereotypy) (18). While social skills group interventions are increasingly popular in the intervention literature (19),

evidence of their external validity is limited (20,21), and they may lack generalization (21,22). Further, there are concerns that social skills training can be counterproductive, inhibiting the development of authentic relationships as autistic individuals attempt to memorize and follow a pre-determined set of social rules (21). This is inherently not authentic to the autistic individual. The heavy focus on autistic deficits has created a gap in the literature, with vocational and academic interventions underrepresented (18). A systematic review found a severe lack of experimental studies that aimed to improve employment outcomes for autistic youth (23). Successful transition to adulthood for autistic adolescents requires more than improving social and communication skills, but rather a range of services aimed at strengthening self-determination, vocational skills, community participation, and self-care (16). There is clear potential to broaden the focus of interventions for autistic adolescents by targeting transition skills and outcomes, in preference to autism-related impairments (16,17).

Transition services for autistic adolescents

Transition to adulthood for autistic individuals is challenging for numerous reasons, including both environmental and individual factors (24). A longitudinal study of 725 autistic youth over four years (15 years old to 19 years old) showed increased isolation after leaving secondary school, with over half of the participants not meeting with friends or talking over the phone in the previous year (25). The loss of structured social activities previously provided by the school environment contributed to isolation in autistic youth (25). Environmental factors do not solely influence transition outcomes and often interact with autism-specific limitations. For example, the inherent social and communication limitations seen in autism are further complicated by the increase in social demands post school (26). Gaining and maintaining employment requires complex social situations such as writing a resume, understanding the social dynamics of a workplace, or disclosing diagnoses to others (26). While the

individual's social and communications skills impact gaining and maintaining employment, the social and attitudinal environment of the workplace is also a factor(27). Navigating the dynamic interplay between a changing environment and the individual's unique needs requires transition planning interventions (28). Within the United States, transitional services are defined by the Individuals with Disabilities Education Act (IDEA) and aim to; assist in the transition from school to post-school activities, including education, employment, and community participation (29). Transitional services focus on individual needs while considering strengths, interests, and preferences (29). While the United States defines transitional services through the IDEA, there is less guidance for the Australian context. The majority of research regarding transitional programs for autistic adolescents have been developed in the United States and may not be applicable to Australian legislation, disability funding, and service provision (28,30). Further, engaging autistic youth in transition planning has remained limited (31). Data taken from a longitudinal survey of 830 autistic students (average age of 14.4 years) found that 22.6% of autistic students did not attend or participate in transition planning interventions and only 2.7% were considered an active participant in transition planning (31). Currently, no national data is available to represent participation in transition planning by Australian autistic adolescents. Overall, transition into adulthood for autistic youth is challenging due to the loss of school structured activity, increased social demands from dynamic social environments, limited context specific guidelines and reduced active participation in transition planning interventions. While experimental studies for autism-specific transition research are lacking (23), similar themes exist across the literature internationally, including incorporating a strength-based individualized approach, providing early work experiences, fostering self-determination, and strengthening relationships (16,26,32,33).

A strength-based approach within transition services involves customizing the service to the autistic adolescent's needs, preferences, interests, and strengths (17,26,32). When applying a strengths-based approach with autistic

adolescents, focused interests are often leveraged to boost confidence and encourage transition planning engagement (33). Interventions involving early work experiences can help autistic adolescents explore career paths, develop interpersonal skills for the workplace, and better understand their strengths (16,26). Transition services focus on developing a broad range of skills beyond social communication skills, including fostering and developing self-determination (16,26,32,34). Self-determination has been found to predict positive employment and education outcomes for individuals with a disability (26,35,36). Throughout the transitional service literature, there is a focus on building, developing, and maintaining relationships between the autistic adolescent, their family, and the community (32). Transition services should adopt a family-centered approach, where families are actively involved in transition planning and receive support in guiding their child to engage with employment and the community (26,32,37). Relationships outside of the family are also meaningful, with transitional services establishing and developing peer relationships, formal relationships with service providers, and natural community supports (32).

Transition intervention for autistic adolescents requires multiple coordinated services and activities; as such, no one intervention can meet all the recommendations. However, interventions aimed at science, technology, engineering, and mathematics (STEM) career paths have gained traction. The focus on STEM career paths for autistic individuals is justified by the empathizing-systemizing theory (38). Systemizing relates to predicting, changing, and influencing a system based upon an agreed-upon set of rules (38). Autistic individuals are thought to have greater systemizing skills, often applicable to STEM career paths (39). The alignment between commonly recognized autistic strengths and STEM-related jobs has driven increasing interest in understanding the role these strengths can play in improving transition and employment outcomes.

Strengths of autistic individuals and STEM career pathways

A survey of international experts identified multiple strengths and abilities of autistic individuals, including attention to detail, a strong sense of morality, mathematical skills, visual perception, creative talents, trustworthiness, and loyalty (60). Autistic individuals identified similar strengths to that of the experts, listing their top strengths as attention to detail, logical reasoning, reliability, focus, and systemizing (84). There is further evidence of these strengths in published research. Visual strengths, specifically visual search tasks requiring identifying a target hidden amongst distractors, are well documented in autistic individuals (85). Some autistic individuals have a greater ability to graphically reproduce a life-size maze than their peers, a finding attributed to their increased ability to discriminate, detect, and memorize visual patterns (86). Attention to detail has been described as a result of weak central coherence, where an autistic individual is more likely to be detailed-focused rather than see the ‘bigger picture’ (87). Alternatively, other authors have associated attention to detail with hyper-systemizing theory, where the individual is detailed oriented to understand the system and rules (88). Similarly, mathematical abilities in autistic individuals have been rationalized through the empathizing-systemizing theory, where autistic individuals have a systemizing preference increasing their ability to predict outputs based upon inputs and operational rules (89). While the empathizing-systemizing theory attempts to explain the features of autism, there is criticism that it cannot account for the underlying mechanisms related to systemizing abilities (90). Further, there is criticism that theory may not be applicable to autistic individuals with intellectual disability (90). Within the autistic community there is additional criticisms of the theory, including, encouraging gender stereotypes by aligning males with systemizing preferences and females with empathizing, and a lack of independent studies that have been able to replicate the results (91).

While there is ongoing discussion in understanding the mechanisms of autistic strengths, the strengths identified are well matched to tasks within STEM fields, which may explain autistic individuals' tertiary education choices. While, research is limited, the US-based National Longitudinal Transition Study-2 provided evidence that autistic students who enrolled in tertiary education were more likely to select STEM pathways than the other disability categories and the general population (92). Further, autistic individuals in the study were more likely to enroll in science and computer science than the general population (92). Even though autistic individuals were more likely to participate in STEM fields once registered, they had the third-lowest enrollment rate among the disability categories (92). An alternative argument to autistic individuals gravitating towards STEM career paths suggests that more autistic individuals work in technology-based professions because the impact of social skill deficits is lessened in these roles (93). Regardless of the appeal of STEM career paths, autistic adolescents are interested and motivated by technology.

Technology use and autistic individuals

Technology use amongst autistic youth can be seen as problematic in the case of overuse and beneficial when their intense interests can be leveraged for therapy. Problematic use has been reported in multiple studies, specifically screen-based activities such as watching television and playing video games (42,43). A study investigating screen-based activities in autistic children (n = 202) and their neurotypical siblings (n = 179) found that autistic children spent 62% more time completing screen-based activities than all non-screen activities combined and experience higher problematic usage than their siblings (42). Problematic video game use was measured via the Problem Video Game Playing Test (48), which measures the core aspects of behavioral addiction, such as, needing to spend increased amounts of time playing (tolerance), unpleasant emotions when playing is stopped (withdrawal), or feeling like playing video games is more important than any other aspect of the person's life

(salience) (48). While there is a concern for problematic screen-based activities, there is the potential to leverage autistic adolescents' motivation for engaging with technology interventions (42). For example, video-based modeling uses video recordings in demonstrating and teaching appropriate behaviors (44). While the technology itself encourages engagement, using a screen-based device is thought to also counteract stimulus over selectivity by minimizing the area of attention required by the autistic individual (44). Video-based modeling is also advantageous as it leverages some autistic individuals' visual learning preferences (45).

Further, socializing and communicating through computers may also appeal to autistic individuals for several reasons. Computer-mediated communication (CMC), such as text messaging, email, or social media messaging, reduces stress in autistic adults by removing nonverbal cues, allowing time to think and respond, and provides more structure to conversations (49). The benefits of CMC extend beyond increased control over communication, with autistic individuals reporting more benefits of CMC compared with non-autistic individuals, such as meeting people with similar interests, joining advocacy or special interest forums, and expressing their true selves online (50). Other technology-based interventions have specifically designed software, such as a computer program with attention-getting audiovisual features to reinforce behavior (51). A potential concern for CMC is the translation of social-communication skills from online to face-to-face communication (52). In response to this, intervention programs have been created which include both computer and face-to-face activities, for example, a collaborative video game that requires the players to work together (52). Compared to a standard behavioral program, autistic children were more motivated, attentive, and learned more vocabulary when using the computer software (51).

Considering the motivation benefits and potential match with autistic strengths, it is unsurprising that technology-based interventions have increased within the literature (53). While a recent systematic review highlighted a clear increase in technology-based interventions for autistic children, it was noted that the majority of research was underpinned by the medical model, employing technology to remediate autism-related deficits (53). The review concluded by recommending that future research investigate the use of technology in developing the strengths of autistic individuals (53).

Strength-based technology clubs for autistic youth

In response to the need for strength-based technology interventions, emerging research has described the delivery of technology clubs for autistic youth (54–56). Strength-based technology clubs for autistic youth inherently incorporate technology into their programs, teaching and developing technology skills. This approach differs from other technology use in autism intervention, where technology is employed in delivering an intervention. For example, online tools have been developed to assist transition planning for autistic adolescents as they prepare to graduate from secondary school (57). These online tools are described as both strength-based and technology-based; however, it is important to note that technology is being used to deliver the intervention, with the program leveraging autistic adolescents' interests in technology to improve motivation to participate (57). This is repeated throughout the existing autism literature with technology being used to deliver interventions, such as video modeling, where desired behaviors are video recorded and then later viewed on a computer or tablet (53,58). Other examples include the creation of specific computer games to target social skills (59) and emotion recognition (60,61). A technology club is separated from other technology-based interventions because it does not just use technology as the intervention delivery method but rather teaches autistic adolescents' technical skills. For example, previous

strength-based technology clubs have taught computer coding languages (62), 3D design programs (56), graphic design, and video game development (54).

While many potential benefits of strength-based technology clubs have been suggested (54,56,63), there is very limited quantitative data to support the claims. Only two studies have been identified that provide quantitative data to support the outcomes of strength-based technology clubs (62,64). One study performed a 3-year longitudinal survey of 52 parents of autistic adolescents who had attended a strength-based technology club (62). Parents responded to a questionnaire using a 10-point Likert scale, with the results indicating parent-reported improvement in adolescents' health and well-being, social relationships, confidence and self-esteem, and a sense of belonging (62). Results were triangulated with open ended questions from parents (62). The limitations of the study include the untested psychometric properties of the measure, parent-reported measures only, and the lack of control group with randomized samples. The second study observed seven autistic children (ages 8-14 years old) participating in a robotics club once per week for four months (64). Video footage was taken of each session and coded by multiple researchers to document collaborative behaviors (64). Observation data was compared with survey data from children and parents. Survey data asked questions about how enjoyable each session was and questions about collaborating with other students (64). The results indicated that when students had more fun during the robotics class, they engaged in more collaborative behaviors and were more likely to share a positive affect (64). The limitations of this study include the small sample size, the untested psychometric properties of the measure, and lack of a control group with randomized samples. While further quantitative testing is required, no current framework exists for the design and delivery of strength-based technology clubs. Other interventions, such as social skills group training, follow a standard pattern for their design and delivery allowing rigorous testing (65).

As a result of the limited quantitative research, available qualitative research relating to strength-based technology clubs was then evaluated. Nine qualitative articles describing strength-based technology clubs were identified. Qualitative data suggests that strength-based technology clubs may include a range of positive outcomes including the development of technical skills (62), improving self-determination (55,56), improving confidence (54,55), developing friendships (54,56), and providing early work experience opportunities (66). In addition, technology clubs act as community activities with outcomes reflecting those of a community social or recreational program. Social and recreational activities outside of school and home are essential for healthy adolescent development (67,68). The benefits of social and recreational programs are well documented in adolescents without disability (69,70), with similar benefits of belonging and developing friendships seen in autistic adolescents (71). Previous technology clubs for autistic adolescents have reported benefits in developing friendships (54,56), improving confidence (54,55), and developing social skills (56,63). While qualitative studies claim to adopt a strength-based approach in delivering technology clubs to autistic adolescents, the strategies employed vary. For example, previous technology programs have targeted the special interest of autistic adolescents (54,56), designed activities to suit intrinsic strengths such as visual-based activities (72), focused outcomes on technical skill development rather than deficits (56), and fostered self-determination through student-led activities (55,56). Universities have hosted technology clubs and, using their resources, have provided work experience for autistic youth (66). Like the quantitative evidence, the initial results are promising; however, there are no clear process, framework, or guidelines for the design and delivery of strength-based technology clubs. Mediation analysis to identify factors influencing dependent variables cannot be employed as too few quantitative studies exist. For this reason, an ethnographic approach was selected to analyze the larger amount of qualitative research and develop a framework for designing and delivering strength-based technology clubs to autistic adolescents.

Transition into adulthood and strength-based technology clubs

While the barriers to gaining and maintaining employment often include core characteristics of autism, such as social and communication limitations, recommendations to improve employment outcomes for autistic adults focus on both impairments and strengths (73). For example, communication limitations may be addressed through workplace education aimed at improving the understanding and acceptance of autism (73). Alternatively, workplace interventions can focus on strengths, such as matching individual strengths of autistic employees with job tasks that suit their skills and abilities (73). The holistic approach applied to improving employment outcomes for autistic adults is also reflected in the autistic adolescent literature. While employment literature for autistic adults focuses on intervention within the workplace, employment literature for autistic adolescents focuses on the preparation for employment, typically seen in transitional services.

Preparing autistic adolescents for employment has a significant focus on improving communication and interpersonal skills, while reducing inappropriate behavior (16,32); however, social, communication and behavioral limitations are not the sole focus. In fact, an overfocus on social and communication skills can potentially restrict opportunities for vocational coursework during secondary school (34). For this reason, strength-based strategies are also recommended, such as providing career exploration and work experience opportunities that are matched to strengths and interests (16,32). Similarly, specific training that builds career-related skills and knowledge is recommended to improve employment outcomes for autistic adolescents (32). Further, transition services also aim to build positive characteristics associated with improved employment outcomes. For example, fostering self-determination in autistic adolescents is well documented for supporting employment outcomes in adulthood (26,32,34).

Transition into adulthood extends beyond gaining employment, and includes postsecondary education, independent living, contributing to the community, and experiencing personal and social relationships (16). Similar to improving employment outcomes, developing and fostering self-determination is considered essential to success in postsecondary education (34). The benefits of social and recreational community programs are well documented in adolescents without disability, including building peer relationships (18,94,95), developing social skills (18,96), discovering personal identity (94,97,98), and reducing risk of depressive symptoms (15,17,98). Similar benefits from out-of-school activities have been documented for adolescents with disabilities, such as, increasing self-determination (99), creating a sense of belonging, and increasing social networks (99,100). While less prominent in the literature, out-of-school activities have shown to have similar benefits for autistic adolescents, such as developing feelings of belonging and friendships (19).While participating in social or recreational activities within the community holds numerous benefits, opportunities to participate in community activities can abruptly disappear after leaving secondary school, as the inherent network and supports are no longer available (11). Similarly, there needs to be opportunity for students to maintain and grow peer relationships developed during secondary school, as ongoing peer relationships can impact adult life, from overall well-being, loneliness, depression, and a sense of belonging (32). Transition planning for autistic adolescents needs to start before exiting secondary school and extend beyond social and communication skills to include other skills, opportunities, and experiences that facilitate positive outcomes in adulthood (16,17).

Strength-based technology programs may provide an opportunity to develop a broader skill set needed for adult life by; developing career specific skills (56), identifying and developing strengths and interests (54,56), fostering self-determination (55,56), providing opportunity to practice social and communication skills in a natural environment (56,63), and developing friendships (54,56). Within the context of this thesis, we considered the

developed strength-based technology club as an intervention, as the club was developed and designed by therapists with therapeutic outcomes in mind. However, the technology club also acts as an out-of-school activity, which inherently may have benefits to autistic adolescents. To improve adulthood outcomes for autistic adolescents, intervention needs to extend beyond social, communication, and behavioral focus. For this reason, this thesis is interested in exploring the impact of strength-based technology programs on a range of outcomes, such as confidence in specific technology skills, self-determination, interest potential post-secondary education fields (i.e. science, technology, engineering, and mathematics), friendship, and loneliness. While strength-based technology clubs for autistic adolescents have been trialed, to date, no research has articulated a comprehensive framework guiding their design and delivery.

The problem

Autistic individuals have poor vocational outcomes in adulthood (9), with technology clubs considered one approach with the potential to improve outcomes. The appeal of employing technology clubs in improving outcomes for autistic youth stems from four areas: 1) alignment with transition service recommendations, specifically, incorporating a strength-based approach (55); 2) autistic youth gravitation towards STEM career paths (46); 3) the high level of motivation for autistic youth to participate in technology-based activities (53), and; 4) the potential benefits to autistic youth participating in out of school and home activities (71). However, progressing understanding of the efficacy of this approach is constrained by the absence of a framework to guide the design and delivery of strength-based technology clubs to autistic youth. Further, in the autism literature, there is evidence of ambiguity in relation to understanding what constitutes a “strength-based approach.” For example, video modeling is referred to as a strength-based intervention given it delivers an intervention primarily through visual information, leveraging the visual strengths of autistic

youth (74). While video modeling uses technology to leverage the visual strengths of autistic youth, it still primarily aims to remediate autism-related deficits (53). It is likely that the difficulty with defining strength-based technology clubs is magnified by varying definitions of a strength-based approach in autism research.

Aim

The overall aim of this thesis was to develop and evaluate a strength-based technology club for autistic adolescents. To achieve this, an evidence-based framework for designing and delivering strength-based technology clubs was developed. A new community-driven strength-based technology club was delivered underpinned by the framework, with its feasibility and sustainability investigated.

Thesis Structure

This research was guided by the Medical Research Council (MRC) Framework for developing and evaluating complex interventions (75). The MRC Framework consists of four stages: 1) Development; 2) Feasibility; 3) Evaluation; and 4) Implementation (75). The development stage stresses the importance of understanding *how* an intervention works and not just *if* an intervention works (76). Understanding *how* an intervention works supports replication across contexts, being primarily concerned with developing a theoretical understanding of its active ingredients (also known as core elements, essential components, or intervention mechanisms) (77). Active ingredients are the discrete aspects of a health intervention that foster change for participants (77). For example, a previous study identified the active ingredients of interactive computer play (ICP) for children with neuromotor impairments because the treatment had gained clinical popularity without understanding *how* the intervention improved outcomes (78). One active ingredient was that the computer programs were very

flexible and so they could be adjusted to the individual treatment needs; another active ingredient was that the computer program allowed the child to control the game, increasing motivation to participate (78). In non-pharmacological health interventions, there are often multiple active ingredients interacting to impact outcomes. The complexity of these interventions often requires a number of research approaches to understand their theoretical underpinnings (77). In this thesis, the active ingredients for strength-based technology clubs were identified through a systematic review (Study One) and a realist evaluation of existing technology clubs (Study Two) (Figure 1.1). The active ingredients were then converted to a practical framework to guide the design and delivery of strength-based technology clubs in Study Three. Feasibility testing was implemented in Study Four guided by Bowen's et al. (79) feasibility framework, investigating aspects such as acceptability, demand, and practicality. Finally, the technology club continued for 12-months with long-term term follow provided during Study Five. In this thesis, the five studies are bookended by an overall introduction (Chapter 1) and discussion (Chapter 7), with Figure 1.1 illustrating the alignment with the MRC development stages. Various methods were employed throughout the thesis and are outlined in Table 1.1.

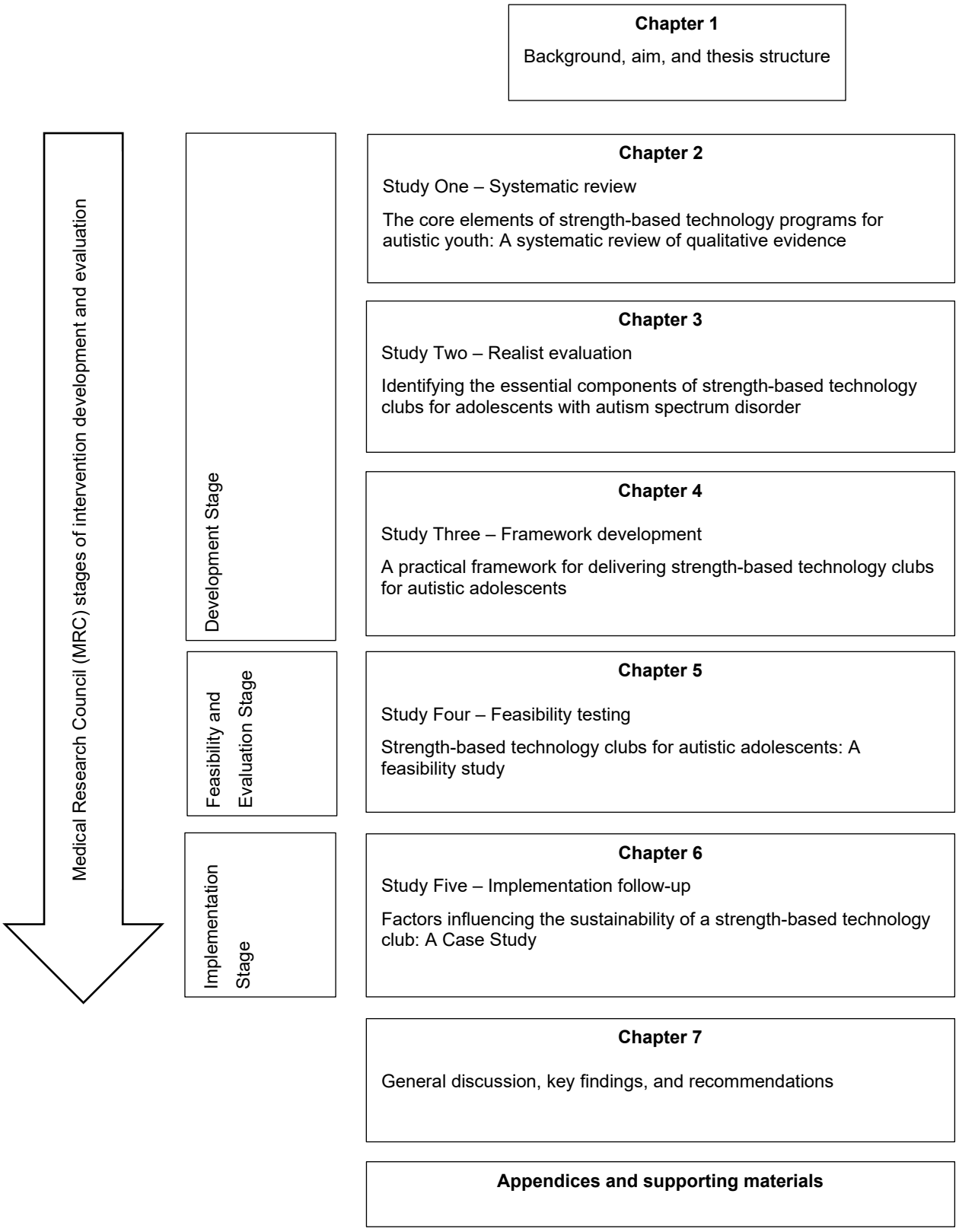

Figure 1.1 Overall thesis structure

Table 1.1 Summary of research methods in each study

Aspect	Study One	Study Two	Study Three	Study Four	Study Five
Design	Meta-ethnographic systematic review	Ethnography	Framework development	Feasibility testing	Implementation case-study
Description	Systematic review of qualitative studies describing active ingredients of strength-based technology clubs for autistic youth	A realist evaluation of three existing strength-based technology clubs employing ethnographic methods to identify active ingredients	Development of a practical framework to guide the design and delivery of strength-based technology clubs for autistic adolescents	Delivery of a 15-week strength-based technology club guided by the newly developed framework and followed by feasibility testing.	Long-term follow up of the technology club identifying factors impacting sustainability.
Sample	*k* = 9 qualitative studies delivering strength-based technology programs to autistic youth	Autistic adolescents, *n* = 23; parents of autistic adolescents, *n* = 25; club facilitators, *n* = 20	N/A	Quantitative Autistic adolescents, *n* = 11 Parents of autistic adolescents, *n* = 12 Qualitative Autistic adolescents, *n* = 14 Parents of autistic adolescents, *n* = 12 Club facilitators, *n* = 8	Club facilitators, *n* = 3 Parent of autistic adolescent, *n* = 2 University coordinator, *n* = 1
Data analysis	Reciprocal, refutational, and line-of-argument synthesis	Thematic analysis underpinned by a realist evaluation framework.	Synthesis of study one and study two results.	Quantitative Wilcoxon signed-rank test Qualitative Thematic analysis underpinned by Bowen's et. (66) feasibility framework.	Thematic analysis underpinned by implementation science.

Study One – Systematic review

Study One is dedicated to developing a theoretical understanding of strength-based technology clubs for autistic adolescents by identifying the active ingredients described in previous research. Systematic reviews are often employed to determine *if* an intervention is effective; however, in this case, a meta-ethnographic systematic review was employed to determine *how* an intervention causes change. A meta-ethnographic approach was adopted to identify and describe the relationship between active ingredients and reported outcomes of strength-based technology clubs for autistic adolescents. This study contributes to the overall thesis by developing a theoretical understanding of *how* strength-based technology clubs impact social confidence, future education or employment options, friendships, and social skills in autistic adolescents.

Status: Considered for publication following revisions in Review Journal of Autism and Developmental Disorders.

Jones M, Falkmer M, Milbourn B, Tan T, Bölte S, Girdler S. The core elements of strength-based technology programs for autistic youth: A systematic review of qualitative evidence. Forthcoming 2021

Study Two – Realist evaluation

Study Two continued to identify the active ingredients of strength-based technology clubs for autistic adolescents by conducting a realist evaluation of three currently existing strength-based technology clubs. Despite the scarcity in the literature surrounding strength-based technology clubs' effectiveness, service providers are presently providing technology clubs to autistic adolescents. A realist evaluation was conducted to identify the active ingredients via ethnographic methods. This study explored three currently existing technology clubs in the community through observations, focus groups, and

interviews. A realist evaluation provided a coding framework that grouped themes into context, mechanisms, and outcomes. Mechanisms are synonymous with active ingredients and represent the discrete aspects of the program that cause change. Outcomes represent change caused by mechanisms. Context themes represent pre-existing factors that the service provider typically does not control, for example, an autistic adolescent's previous experience with bullying, which may influence how they participate in the program. This study contributed to the thesis by providing valuable insight into how strength-based technology clubs work from adolescents', parents', and facilitators' viewpoints.

Status: Published in Developmental Neurorehabilitation

Jones M, Falkmer M, Milbourn B, Tan T, Bölte S, Girdler S. Identifying the essential components of strength-based technology clubs for adolescents with autism spectrum disorder. Dev Neurorehabil [Internet]. 2021 Mar 8 [cited 2021 Mar 25];1–15. Available from: https://www.tandfonline.com/doi/full/10.1080/17518423.2021.1886192. DOI:10.1080/17518423.2021.1886192

Study Three – Framework development

Study Three involved developing an evidence-based framework to guide the design and delivery of future strength-based technology clubs for autistic adolescents. Study Three synthesized the systematic review results (Study One) and the realist evaluation (Study Two) to create a comprehensive description of all active ingredients. The systematic review provided potential active ingredients from the literature, while the Realist Evaluation provided active ingredients from clinical practice. The synthesized results were compared to adolescent health theories to create a new evidence-based framework. The framework created has four components represented by the acronym IVAR: interest, value, autonomy, and requirements. Examples of applying the framework were provided through practical recommendations.

Status: Submitted for publication

Jones M, Falkmer M, Milbourn B, Tele T, Bölte S, Girdler S. A practical framework for delivering strength-based technology clubs for adolescents with autism spectrum disorder. Forthcoming 2021

Study Four – Feasibility testing

Study Four involved applying the newly developed framework in delivering a new strength-based technology club within the community, evaluated via feasibility testing. Study Four described the entire process of creating a community-based strength-based technology club for autistic adolescents. Funding was received for technology hardware and software, a local school donated classroom space, and volunteer facilitators were recruited from the community. Each aspect of the club was guided by the IVAR strength-based framework developed in Study Three. Autistic adolescents participated in 15-weeks of the strength-based technology club, participating in robotics, video game development, and computer coding activities. Feasibility was tested via quantitative and qualitative methods. Adolescents (*n* = 11) and parents (*n* = 12) completed pretest and posttest measures to provide quantitative data on preliminary efficacy. Adolescents (*n* = 14), parents (*n* = 12), and facilitators (*n* = 8) participated in focus groups and interviews following 15 weeks to provide qualitative data on the feasibility areas outline by Bowen's et al. (79). Based on the results, recommendations were made for further improving the strength-based technology club.

Status: Submitted for publication

Jones M, Falkmer M, Milbourn B, Tan T, Bölte S, Girdler S. Strength-based technology clubs for autistic adolescents: A feasibility study. Forthcoming 2021

Study Five – Implementation follow up

Guided by the MRC framework (75) and best practices for implementation research (80), Study Five involved transferring control of the strength-based technology club to the community. To date, the strength-based technology club has continued to operate independently of the first author for over 12 months, coordinated by volunteers. Study Five investigated factors impacting the sustainability of the club through qualitative methods. Separate interviews were conducted with parents of autistic adolescents (*n* = 2), club facilitators (*n* = 3), and a university coordinator (*n* = 1). Thematic analysis revealed factors impacting the sustainability of strength-based technology clubs and recommendations for modifying the IVAR strength-based framework.

Status: Submitted for publication

Jones M, Falkmer M, Milbourn B, Tan T, Bölte S, Girdler S. Factors influencing the sustainability of a strength-based technology club: A case study. Forthcoming 2021

General discussion

Chapter 7 synthesizes the studies, providing an overview of the research findings. The unique contribution of this thesis is discussed, followed by recommendations for future research. The general discussion contributes to this thesis by examining how the newly developed framework could apply to other areas of autism intervention and not only technology-based activities.

References

1. Peters DH, Tran NT, Adam T. Implementation research in health: A practical guide [Internet]. World Health Organization; 2013 [cited 2020 Dec 23]. Available from: http://who.int/alliance-hpsr/alliancehpsr_irpguide.pdf

2. Proctor E, Silmere H, Raghavan R, Hovmand P, Aarons G, Bunger A, et al. Outcomes for implementation research: Conceptual distinctions, measurement challenges, and research agenda. Adm Policy Ment Heal Ment Heal Serv Res [Internet]. 2011 Mar 19 [cited 2020 Nov 26];38(2):65–76. Available from: http://link.springer.com/10.1007/s10488-010-0319-7

3. Kenny L, Hattersley C, Molins B, Buckley C, Povey C, Pellicano E. Which terms should be used to describe autism? Perspectives from the UK autism community. Autism [Internet]. 2016 May [cited 2020 Nov 10];20(4):442–62. Available from: http://journals.sagepub.com/doi/10.1177/1362361315588200

4. American Psychiatric Association. Diagnostic and statistical manual of mental disorders: DSM-5. Fifth ed. Washington, DC: American Psychiatric Publishing; 2013.

5. Australian Bureau of Statistics. Disability, ageing and carers, Australia: Summary of findings [Internet]. Canberra, Australia; 2019 [cited 2020 Sep 9]. Available from: https://www.abs.gov.au/statistics/health/disability/disability-ageing-and-carers-australia-summary-findings/2018#autism-in-australia

6. Steinhausen HC, Mohr Jensen C, Lauritsen MB. A systematic review and meta-analysis of the long-term overall outcome of autism spectrum disorders in adolescence and adulthood. Acta Psychiatr Scand [Internet]. 2016;133(6):445–52. Available from: https://pubmed.ncbi.nlm.nih.gov/26763353/

7. Cimera RE, Cowan RJ. The costs of services and employment outcomes achieved by adults with autism in the US. Autism [Internet]. 2009 May

[cited 2020 Jan 18];13(3):285–302. Available from: http://journals.sagepub.com/doi/10.1177/1362361309103791

8. Howlin P, Goode S, Hutton J, Rutter M. Adult outcome for children with autism. J Child Psychol Psychiatry [Internet]. 2004 Feb [cited 2020 Jan 18];45(2):212–29. Available from: http://doi.wiley.com/10.1111/j.1469-7610.2004.00215.x

9. Roux AM, Shattuck PT, Cooper BP, Anderson KA, Wagner M, Narendorf SC. Postsecondary employment experiences among young adults with an autism spectrum disorder. J Am Acad Child Adolesc Psychiatry [Internet]. 2013 Sep [cited 2021 Jan 1];52(9):931–9. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0890856713003778

10. Taylor JL, Seltzer MM. Employment and post-secondary educational activities for young adults with autism spectrum disorders during the transition to adulthood. J Autism Dev Disord [Internet]. 2011;41(5):566–74. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3033449/

11. Myers E, Davis BE, Stobbe G, Bjornson K. Community and social participation among individuals with autism spectrum disorder transitioning to adulthood. J Autism Dev Disord [Internet]. 2015 Aug 1 [cited 2020 Aug 10];45(8):2373–81. Available from: http://link.springer.com/10.1007/s10803-015-2403-z

12. Shattuck PT, Narendorf SC, Cooper B, Sterzing PR, Wagner M, Taylor JL. Postsecondary education and employment among youth with an autism spectrum disorder. Pediatrics [Internet]. 2011;129(6):1042–9. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3362908/pdf/peds.2011-2864.pdf

13. Orsmond GI, Krauss MW, Seltzer MM. Peer relationships and social and recreational activities among adolescents and adults with autism. J Autism Dev Disord [Internet]. 2004 Jun [cited 2020 Apr 30];34(3):245–56. Available from:

http://link.springer.com/10.1023/B:JADD.0000029547.96610.df

14. Taylor JL, Henninger NA, Mailick MR. Longitudinal patterns of employment and postsecondary education for adults with autism and average-range IQ. Autism Int J Res Pract [Internet]. 2015;19(7):785–93. Available from: https://pubmed.ncbi.nlm.nih.gov/26019306/

15. Orsmond GI, Shattuck PT, Cooper BP, Sterzing PR, Anderson KA. Social participation among young adults with an autism spectrum disorder. J Autism Dev Disord [Internet]. 2013 Nov 25 [cited 2020 Nov 17];43(11):2710–9. Available from: http://link.springer.com/10.1007/s10803-013-1833-8

16. Hendricks DR, Wehman P. Transition From School to Adulthood for Youth With Autism Spectrum Disorders. Focus Autism Other Dev Disabl [Internet]. 2009 Jun 24 [cited 2020 Jul 5];24(2):77–88. Available from: http://journals.sagepub.com/doi/10.1177/1088357608329827

17. Anderson KA, Sosnowy C, Kuo AA, Shattuck PT. Transition of individuals with autism to adulthood: A review of qualitative studies. Pediatrics [Internet]. 2018 Apr 2 [cited 2020 Oct 16];141(s4):S318–27. Available from: http://pediatrics.aappublications.org/lookup/doi/10.1542/peds.2016-4300I

18. McDonald TA, Machalicek W. Systematic review of intervention research with adolescents with autism spectrum disorders. Res Autism Spectr Disord [Internet]. 2013 Nov [cited 2021 Mar 24];7(11):1439–60. Available from: https://linkinghub.elsevier.com/retrieve/pii/S1750946713001414

19. Reichow B, Steiner AM, Volkmar F. Social skills groups for people aged 6 to 21 with autism spectrum disorders (ASD). Cochrane Database Syst Rev [Internet]. 2012 Jul 11 [cited 2020 Aug 10];(7):1–38. Available from: http://doi.wiley.com/10.1002/14651858.CD008511.pub2

20. Jonsson U, Choque Olsson N, Bölte S. Can findings from randomized controlled trials of social skills training in autism spectrum disorder be

generalized? The neglected dimension of external validity. Autism [Internet]. 2016 Apr 11 [cited 2020 Jul 5];20(3):295–305. Available from: http://journals.sagepub.com/doi/10.1177/1362361315583817

21. Bottema-Beutel K, Park H, Kim SY. Commentary on social skills training curricula for individuals with ASD: Social interaction, authenticity, and stigma. J Autism Dev Disord [Internet]. 2018;48(3):953–64. Available from: http://dx.doi.org/10.1007/s10803-017-3400-1

22. Carruthers S, Pickles A, Slonims V, Howlin P, Charman T. Beyond intervention into daily life: A systematic review of generalisation following social communication interventions for young children with autism. Autism Res [Internet]. 2020 Apr 14 [cited 2020 Nov 12];13(4):506–22. Available from: https://onlinelibrary.wiley.com/doi/10.1002/aur.2264

23. Westbrook JD, Fong CJ, Nye C, Williams A, Wendt O, Cortopassi T. Transition services for youth with autism: A systematic review. Res Soc Work Pract [Internet]. 2015 Jan 5 [cited 2020 Jan 10];25(1):10–20. Available from: http://journals.sagepub.com/doi/10.1177/1049731514524836

24. Jonsson U, Coco C, Fridell A, Brown S, Berggren S, Hirvikoski T, et al. Proof of concept: The TRANSITION program for young adults with autism spectrum disorder and/or attention deficit hyperactivity disorder. Scand J Occup Ther [Internet]. 2021;28(2):78–90. Available from: https://doi.org/10.1080/11038128.2019.1695933

25. Liptak GS, Kennedy JA, Dosa NP. Social participation in a nationally representative sample of older youth and young adults with autism. J Dev Behav Pediatr. 2011;32(4):277–83.

26. Lee G, Carter EW. Preparing transition-age students with high-functioning autism spectrum disorders for meaningful work. Psychol Sch [Internet]. 2012 Dec;49(10):988–1000. Available from: http://doi.wiley.com/10.1002/pits.21651

27. Scott M, Milbourn B, Falkmer M, Black M, Bölte S, Halladay A, et al. Factors impacting employment for people with autism spectrum disorder: A scoping review. Autism. 2018;

28. Hatfield M, Falkmer M, Falkmer T, Ciccarelli M. Effectiveness of the BOOST-A^{TM} online transition planning program for adolescents on the autism spectrum: a quasi-randomized controlled trial. Child Adolesc Psychiatry Ment Health [Internet]. 2017 Dec 10 [cited 2020 Jan 8];11(1):54. Available from: http://capmh.biomedcentral.com/articles/10.1186/s13034-017-0191-2

29. Individuals with Disabilities Education Act, 20 U.S.C. § 1401 [Internet]. 2004. Available from: https://sites.ed.gov/idea/statute-chapter-33/subchapter-i/1401

30. Hatfield M, Falkmer M, Falkmer T, Ciccarelli M. Process Evaluation of the BOOST-A^{TM} Transition Planning Program for Adolescents on the Autism Spectrum: A Strengths-Based Approach. J Autism Dev Disord [Internet]. 2018;48(2):377–88. Available from: http://dx.doi.org/10.1007/s10803-017-3317-8

31. Shogren KA, Plotner AJ. Transition planning for students with intellectual disability, autism, or other disabilities: Data from the national longitudinal transition study-2. Intellect Dev Disabil. 2012;50(1):16–30.

32. Test DW, Smith LE, Carter EW. Equipping youth with autism spectrum disorders for adulthood: Promoting rigor, relevance, and relationships. Remedial Spec Educ [Internet]. 2014 Mar 6 [cited 2021 Mar 24];35(2):80–90. Available from: http://journals.sagepub.com/doi/10.1177/0741932513514857

33. Hatfield M, Ciccarelli M, Falkmer T, Falkmer M. Factors related to successful transition planning for adolescents on the autism spectrum. J Res Spec Educ Needs [Internet]. 2018 Jan [cited 2020 Oct 16];18(1):3–14. Available from: http://doi.wiley.com/10.1111/1471-3802.12388

34. Wehman P, Schall C, Carr S, Targett P, West M, Cifu G. Transition from school to adulthood for youth with autism spectrum disorder. J Disabil Policy Stud [Internet]. 2014 Jun 11 [cited 2020 Jul 5];25(1):30–40. Available from: http://journals.sagepub.com/doi/10.1177/1044207313518071

35. Test DW, Mazzotti VL, Mustian AL, Fowler CH, Kortering L, Kohler P. Evidence-based secondary transition predictors for improving postschool outcomes for students with disabilities. Career Dev Transit Except Individ [Internet]. 2009 [cited 2020 Jul 5];32(3):160–81. Available from: http://cde.sagepub.com/cgi/doi/10.1177/0885728809346960

36. Shogren KA, Wehmeyer ML, Palmer SB, Rifenbark GG, Little TD. Relationships between self-determination and postschool outcomes for youth with disabilities. J Spec Educ [Internet]. 2015 [cited 2020 Dec 23];48(4):256–67. Available from: https://journals.sagepub.com/doi/10.1177/0022466913489733

37. Hagner D, Kurtz A, Cloutier H, Arakelian C, Brucker DL, May J. Outcomes of a family-centered transition process for students with autism spectrum disorders. Focus Autism Other Dev Disabl [Internet]. 2012 Mar 14 [cited 2020 Nov 18];27(1):42–50. Available from: http://journals.sagepub.com/doi/10.1177/1088357611430841

38. Baron-Cohen S. Autism: The Empathizing-Systemizing (E-S) Theory. Ann N Y Acad Sci [Internet]. 2009 Mar [cited 2020 Nov 19];1156(1):68–80. Available from: http://doi.wiley.com/10.1111/j.1749-6632.2009.04467.x

39. Baron-Cohen S, Wheelwright S, Burtenshaw A, Hobson E. Mathematical talent is linked to autism. Hum Nat [Internet]. 2007 Sep 19 [cited 2020 Sep 15];18(2):125–31. Available from: http://link.springer.com/10.1007/s12110-007-9014-0

40. de Schipper E, Mahdi S, de Vries P, Granlund M, Holtmann M, Karande S, et al. Functioning and disability in autism spectrum disorder: A worldwide survey of experts. Autism Res [Internet]. 2016 Sep 8 [cited 2020 Aug

11];9(9):959–69. Available from: https://onlinelibrary.wiley.com/doi/10.1002/aur.1592

41. Lorenz T, Heinitz K. Aspergers – Different, not less: Occupational strengths and job interests of individuals with Asperger's syndrome. Dichter GS, editor. PLoS One [Internet]. 2014 Jun 20 [cited 2021 Mar 24];9(6):e100358. Available from: https://dx.plos.org/10.1371/journal.pone.0100358

42. Kaldy Z, Giserman I, Carter AS, Blaser E. The mechanisms underlying the ASD advantage in visual search. J Autism Dev Disord [Internet]. 2016 May 4 [cited 2020 Nov 19];46(5):1513–27. Available from: http://link.springer.com/10.1007/s10803-013-1957-x

43. Caron M. Do high functioning persons with autism present superior spatial abilities? Neuropsychologia [Internet]. 2004 [cited 2020 Nov 23];42(4):467–81. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0028393203002392

44. Happé F, Frith U. The weak coherence account: Detail-focused cognitive style in autism spectrum disorders. J Autism Dev Disord [Internet]. 2006 Jan 1 [cited 2020 Nov 19];36(1):5–25. Available from: http://link.springer.com/10.1007/s10803-005-0039-0

45. Baron-Cohen S, Ashwin E, Ashwin C, Tavassoli T, Chakrabarti B. Talent in autism: hyper-systemizing, hyper-attention to detail and sensory hypersensitivity. Philos Trans R Soc B Biol Sci [Internet]. 2009 May 27 [cited 2020 Sep 15];364(1522):1377–83. Available from: https://royalsocietypublishing.org/doi/10.1098/rstb.2008.0337

46. Wei X, Yu JW, Shattuck P, McCracken M, Blackorby J. Science, technology, engineering, and mathematics (STEM) participation among college students with an autism spectrum disorder. J Autism Dev Disord [Internet]. 2013 Jul 1 [cited 2020 Jan 20];43(7):1539–46. Available from: http://link.springer.com/10.1007/s10803-012-1700-z

47. Spek AA, Velderman E. Examining the relationship between autism spectrum disorders and technical professions in high functioning adults. Res Autism Spectr Disord [Internet]. 2013;7(5):606–12. Available from: http://dx.doi.org/10.1016/j.rasd.2013.02.002

48. King DL, Delfabbro PH, Zajac IT. Preliminary validation of a new clinical tool for identifying problem video game playing. Int J Ment Health Addict. 2011;9:72–87.

49. Burke M, Kraut R, Williams D. Social use of computer-mediated communication by adults on the autism spectrum. In: Proceedings of the 2010 ACM conference on Computer supported cooperative work - CSCW '10 [Internet]. New York, New York, USA: ACM Press; 2010. p. 425. Available from: https://dl.acm.org/doi/10.1145/1718918.1718991

50. Gillespie-Lynch K, Kapp SK, Shane-Simpson C, Smith DS, Hutman T. Intersections between the autism spectrum and the internet: Perceived benefits and preferred functions of computer-mediated communication. Intellect Dev Disabil [Internet]. 2014 Dec 1 [cited 2020 Sep 19];52(6):456–69. Available from: https://meridian.allenpress.com/idd/article/52/6/456/1872/Intersections-Between-the-Autism-Spectrum-and-the

51. Moore M, Calvert S. Brief report: Vocabulary acquisition for children with autism. Teacher or computer instruction. J Autism Dev Disord. 2000;30(4):359–62.

52. Sturm D, Kholodovsky M, Arab R, Smith DS, Asanov P, Gillespie-Lynch K. Participatory design of a hybrid kinect game to promote collaboration between autistic players and their peers. Int J Hum Comput Interact [Internet]. 2019 [cited 2020 Dec 5];35(8):706–23. Available from: https://doi.org/10.1080/10447318.2018.1550180

53. Virnes M, Kärnä E, Vellonen V. Review of research on children with autism spectrum disorder and the use of technology. J Spec Educ Technol [Internet]. 2015 Mar [cited 2020 Jan 8];30(1):13–27. Available from:

http://journals.sagepub.com/doi/10.1177/016264341503000102

54. Ashburner JK, Bobir NI, van Dooren K. Evaluation of an innovative interest-based post-school transition programme for young people with autism spectrum disorder. Int J Disabil Dev Educ [Internet]. 2018 May 4 [cited 2020 May 6];65(3):262–85. Available from: https://www.tandfonline.com/doi/full/10.1080/1034912X.2017.1403012

55. Dunn L, Diener M, Wright C, Wright S, Narumanchi A. Vocational exploration in an extracurricular technology program for youth with autism. Albin TJ, editor. Work [Internet]. 2015 Sep 30 [cited 2020 Jul 5];52(2):457–68. Available from: https://www.medra.org/servlet/aliasResolver?alias=iospress&doi=10.3233/WOR-152160

56. Diener ML, Wright CA, Dunn L, Wright SD, Anderson LL, Smith KN. A creative 3D design programme: Building on interests and social engagement for students with autism spectrum disorder (ASD). Int J Disabil Dev Educ [Internet]. 2016 Mar 3 [cited 2020 May 6];63(2):181–200. Available from: http://www.tandfonline.com/doi/full/10.1080/1034912X.2015.1053436

57. Hatfield M, Murray N, Ciccarelli M, Falkmer T, Falkmer M. Pilot of the BOOST-A™: An online transition planning program for adolescents with autism. Aust Occup Ther J. 2017;64(6):448–56.

58. Flores MM, Hill DA, Faciane LB, Edwards MA, Tapley SC, Dowling SJ. The Apple iPad as assistive technology for story-based interventions. J Spec Educ Technol. 2014;29(2):27–37.

59. Beaumont R, Sofronoff K. A multi-component social skills intervention for children with Asperger syndrome: The Junior Detective Training Program. J Child Psychol Psychiatry Allied Discip. 2008;49(7):743–53.

60. Silver M, Oakes P. Evaluation of a new computer intervention to teach people with autism or Asperger syndrome to recognize and predict

emotions in others. Autism. 2001;5(3):299–316.

61. Tanaka JW, Wolf JM, Klaiman C, Koenig K, Cockburn J, Herlihy L, et al. Using computerized games to teach face recognition skills to children with autism spectrum disorder: The Let's Face It! program. J Child Psychol Psychiatry Allied Discip. 2010;51(8):944–52.

62. Lee EAL, Black MH, Falkmer M, Tan T, Sheehy L, Bölte S, et al. "We can see a bright future": Parents' perceptions of the outcomes of participating in a strengths-based program for adolescents with autism spectrum disorder. J Autism Dev Disord [Internet]. 2020;50(9):3179–94. Available from: https://doi.org/10.1007/s10803-020-04411-9

63. Wright C, Diener ML, Dunn L, Wright SD, Linnell L, Newbold K, et al. SketchUp™: A technology tool to facilitate intergenerational family relationships for children with autism spectrum disorders (ASD). Fam Consum Sci Res J [Internet]. 2011 Dec [cited 2020 Aug 5];40(2):135–49. Available from: http://doi.wiley.com/10.1111/j.1552-3934.2011.02100.x

64. Wainer J, Ferrari E, Dautenhahn K, Robins B. The effectiveness of using a robotics class to foster collaboration among groups of children with autism in an exploratory study. Pers Ubiquitous Comput [Internet]. 2010 Jul 12 [cited 2020 Jan 30];14(5):445–55. Available from: http://link.springer.com/10.1007/s00779-009-0266-z

65. Afsharnejad B, Falkmer M, Black MH, Alach T, Lenhard F, Fridell A, et al. KONTAKT® social skills group training for Australian adolescents with autism spectrum disorder: a randomized controlled trial. Eur Child Adolesc Psychiatry [Internet]. 2021;(0123456789). Available from: https://doi.org/10.1007/s00787-021-01814-6

66. Lee E, Black MH, Tan T, Falkmer T, Girdler S. "I'm destined to ace this": Work experience placement during high school for individuals with autism spectrum disorder. J Autism Dev Disord [Internet]. 2019 Aug 3 [cited 2020 Jan 8];49(8):3089–101. Available from: http://link.springer.com/10.1007/s10803-019-04024-x

67. Bohnert A, Aikins JW, Arola NT. Regrouping: Organized activity involvement and social adjustment across the transition to high school. In: Fredricks JA, Simpkins SD, editors. Organized Out-of-School Activities: Settings for Peer Relationships New Directions for Child and Adolescent Development. 2013. p. 57–75.

68. Dawes NP, Larson R. How youth get engaged: Grounded-theory research on motivational development in organized youth programs. Dev Psychol [Internet]. 2011 Jan [cited 2020 Aug 5];47(1):259–69. Available from: http://doi.apa.org/getdoi.cfm?doi=10.1037/a0020729

69. Randall ET, Bohnert AM. Organized activity involvement, depressive symptoms, and social adjustment in adolescents: Ethnicity and socioeconomic status as moderators. J Youth Adolesc [Internet]. 2009 Oct 28 [cited 2020 Aug 26];38(9):1187–98. Available from: http://link.springer.com/10.1007/s10964-009-9417-9

70. Barber BL, Stone MR, Hunt JE, Eccles JS. Benefits of activity participation: The roles of identity affirmation and peer group norm sharing. In: Organized Activities As Contexts of Development: Extracurricular Activities, After School and Community Programs. Taylor & Francis Group; 2005. p. 185–210.

71. Agran M, Achola E, Nixon CA, Wojcik A, Cain I, Thoma C, et al. Participation of students with intellectual and developmental disabilities in extracurricular activities: Does inclusion end at 3:00? Educ Train Autism Dev Disabil. 2017;52(1):3–12.

72. Bianco M, Carothers DE, Smiley LR. Gifted Students With Asperger Syndrome. Interv Sch Clin [Internet]. 2009 Mar 1 [cited 2020 May 6];44(4):206–15. Available from: http://journals.sagepub.com/doi/10.1177/1053451208328827

73. Black MH, Mahdi S, Milbourn B, Scott M, Gerber A, Esposito C, et al. Multi-informant international perspectives on the facilitators and barriers to

employment for autistic adults. Autism Res [Internet]. 2020 Jul 14 [cited 2020 Oct 16];13(7):1195–214. Available from: https://onlinelibrary.wiley.com/doi/abs/10.1002/aur.2288

74. Jung S, Sainato DM. Teaching games to young children with autism spectrum disorder using special interests and video modelling. J Intellect Dev Disabil [Internet]. 2015 Apr 3 [cited 2020 Dec 29];40(2):198–212. Available from: http://www.tandfonline.com/doi/full/10.3109/13668250.2015.1027674

75. Craig P, Dieppe P, Macintyre S, Michie S, Nazareth I, Petticrew M. Developing and evaluating complex interventions: the new Medical Research Council guidance. BMJ [Internet]. 2008 Sep 29 [cited 2020 Jul 30];a1655. Available from: https://www.bmj.com/lookup/doi/10.1136/bmj.a1655

76. Campbell N, Murray E, Darbyshire J, Emery J, Farmer A, Griffiths F, et al. Designing and evaluating complex interventions to improve health care. BMJ [Internet]. 2007 [cited 2020 Jul 20];334(7591):455–9. Available from: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1808182&tool=pmcentrez&rendertype=abstract

77. Campbell M, Fitzpatrick R, Haines A, Kinmouth A, Sandercock P, Spiegelhalter D, et al. Framework for design and evaluation of complex interventions to improve health. BMJ [Internet]. 2000 [cited 2020 Jul 20];321:694–6. Available from: http://www.ncbi.nlm.nih.gov/pubmed/1118564%5Cnhttp://www.bmj.com/cgi/doi/10.1136/bmj.321.7262.694

78. Levac D, Rivard L, Missiuna C. Defining the active ingredients of interactive computer play interventions for children with neuromotor impairments: A scoping review. Res Dev Disabil [Internet]. 2012 Jan [cited 2020 Aug 24];33(1):214–23. Available from: https://linkinghub.elsevier.com/retrieve/pii/S089142221100343X

79. Bowen DJ, Kreuter M, Spring B, Cofta-Woerpel L, Linnan L, Weiner D, et

al. How we design feasibility studies. Am J Prev Med [Internet]. 2009 May [cited 2019 Sep 10];36(5):452–7. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0749379709000968

80. Hull L, Goulding L, Khadjesari Z, Davis R, Healey A, Bakolis I, et al. Designing high-quality implementation research: development, application, feasibility and preliminary evaluation of the implementation science research development (ImpRes) tool and guide. Implement Sci [Internet]. 2019 Dec 14 [cited 2020 Nov 20];14(1):80. Available from: https://implementationscience.biomedcentral.com/articles/10.1186/s13012-019-0897-z

Chapter 2: The core elements of strength-based technology programs for autistic youth: A systematic review of qualitative evidence

This chapter is currently considered for publication following revisions in Review Journal of Autism and Developmental Disorders.

Jones M, Falkmer M, Milbourn B, Tan T, Bölte S, Girdler S. The core elements of strength-based technology programs for autistic youth: A systematic review of qualitative evidence. Forthcoming 2021

Author contribution statement: Chapter 2

As co-authors of the paper entitled, 'The core elements of strength-based technology programs for autistic youth: A systematic review of qualitative evidence', we confirm that Matthew Jones has been the principal researcher and has made the following contributions:

- Conceptualizing the research design
- Data collection, analysis, and synthesis
- Writing the manuscript
- Journal correspondence

Our contribution to the paper was consistent with the role of supervisors and involved the following contributions:

- Assistance with conceptualizing the research design
- Assistance with analysis and interpretation
- Review and editing of the manuscript

Matthew Jones (Candidate)	22nd March 2021
Professor Sonya Girdler	22nd March 2021
Dr Marita Falkmer	22nd March 2021
Dr Ben Milbourn	22nd March 2021
Professor Tele Tan	22nd March 2021
Professor Sven Bölte	22nd March 2021

Preface

Chapter 2 presents a systematic review of qualitative studies synthesized through meta-ethnography. The systematic review contributed to the development stage of the MRC framework (1) by identifying the active ingredients of strength-based technology clubs for autistic youth (Figure 2.1). Identifying active ingredients is the first stage in developing a theoretical understanding of how strength-based technology clubs cause change for autistic adolescents.

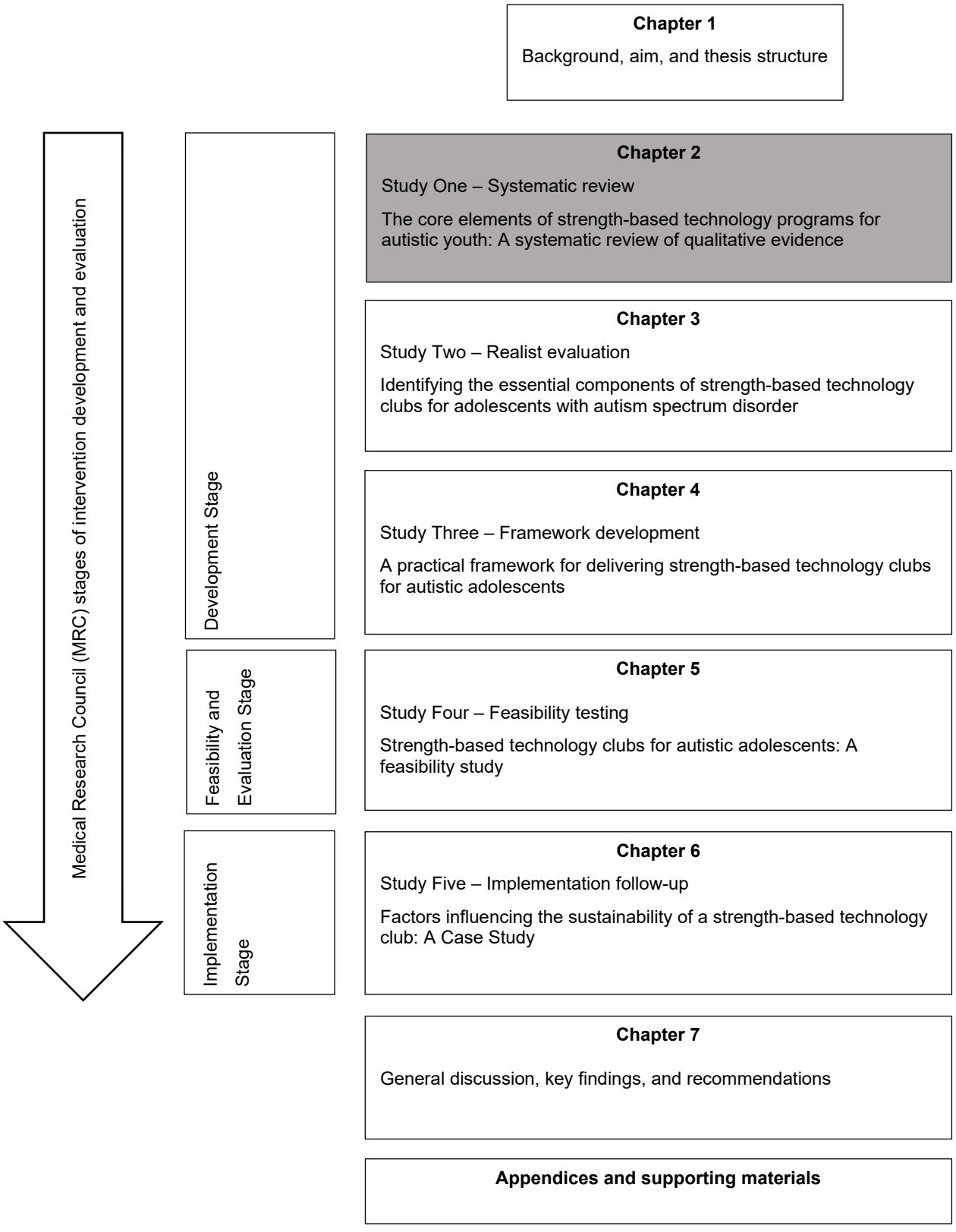

Figure 2.1 Overall thesis structure in relation to Chapter 2

Content is removed due to copyright restrictions

References

1. Craig P, Dieppe P, Macintyre S, Michie S, Nazareth I, Petticrew M. Developing and evaluating complex interventions: the new Medical Research Council guidance. BMJ [Internet]. 2008 Sep 29 [cited 2020 Jul 30];a1655. Available from: https://www.bmj.com/lookup/doi/10.1136/bmj.a1655

Chapter 3: Identifying the essential components of strength-based technology clubs for adolescents with autism spectrum disorder

This is an Accepted Manuscript of an article published by Taylor & Francis in Developmental Neurorehabilitation on 8th March 2021, available online: https://www.tandfonline.com/doi/full/10.1080/17518423.2021.1886192.

Jones M, Falkmer M, Milbourn B, Tan T, Bölte S, Girdler S. Identifying the essential components of strength-based technology clubs for adolescents with autism spectrum disorder. Dev Neurorehabil [Internet]. 2021 Mar 8 [cited 2021 Mar 25];1–15. Available from: https://www.tandfonline.com/doi/full/10.1080/17518423.2021.1886192. DOI:10.1080/17518423.2021.1886192

Author contribution statement: Chapter 3

As co-authors of the paper entitled, 'Identifying the essential components of strength-based technology clubs for adolescents with autism spectrum disorder', we confirm that Matthew Jones has been the principal researcher and has made the following contributions:

- Conceptualizing the research design
- Data collection, analysis, and synthesis
- Writing the manuscript
- Journal correspondence

Our contribution to the paper was consistent with the role of supervisors and involved the following contributions:

- Assistance with conceptualizing the research design
- Assistance with analysis and interpretation
- Review and editing of the manuscript

Matthew Jones (Candidate)	22nd March 2021
Professor Sonya Girdler	22nd March 2021
Dr Marita Falkmer	22nd March 2021
Dr Ben Milbourn	22nd March 2021
Professor Tele Tan	22nd March 2021
Professor Sven Bölte	22nd March 2021

Preface

Chapter 3 undertook a realist evaluation of three existing strength-based technology clubs to identify the active ingredients further. Qualitative data from observations, focus groups, and interviews explored the active ingredients from the perspective of autistic adolescents, parents of autistic adolescents, and club facilitators. This chapter is aligned with the development stage of the MRC framework (Figure 3.1) and builds on the results of the systematic review in forming a theoretical understanding of strength-based technology clubs for autistic adolescents.

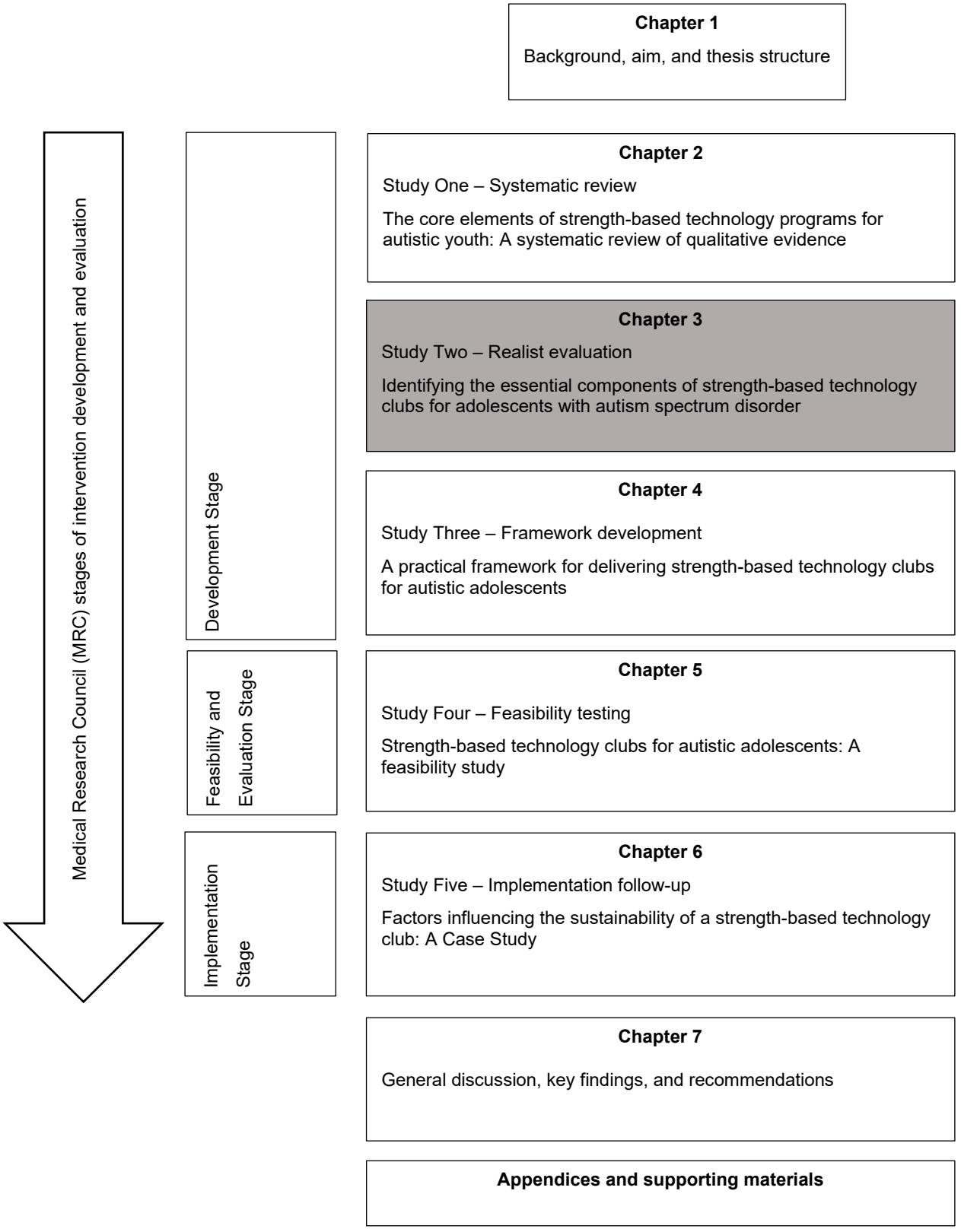

Figure 3.1 Overall thesis structure in relation to Chapter 3

Content is removed due to copyright restrictions

Chapter 4: A practical framework for delivering strength-based technology clubs for autistic adolescents

This chapter has been submitted for publication.

Jones M, Falkmer M, Milbourn B, Tan T, Bölte S, Girdler S. Strength-based technology clubs for autistic adolescents: A feasibility study. Forthcoming 2021

Author contribution statement: Chapter 4

As co-authors of the paper entitled, ‘A practical framework for delivering strength-based technology clubs for autistic adolescents,’ we confirm that Matthew Jones has been the principal researcher and has made the following contributions:

- Conceptualizing the theoretical framework
- Designing the theoretical framework
- Writing the manuscript
- Journal correspondence

Our contribution to the paper was consistent with the role of supervisors and involved the following contributions:

- Assistance with conceptualizing the theoretical framework
- Assistance with the design of the theoretical framework
- Review and editing of the manuscript

Matthew Jones (Candidate)	22nd March 2021
Professor Sonya Girdler	22nd March 2021
Dr Marita Falkmer	22nd March 2021
Dr Ben Milbourn	22nd March 2021
Professor Tele Tan	22nd March 2021
Professor Sven Bölte	22nd March 2021

Preface

Chapter 4 synthesized the results of the systematic review (Chapter 2, Study One) and the realist evaluation (Chapter 3, Study Two) to produce a comprehensive list of active ingredients of strength-based technology clubs for autistic adolescents. A new practical framework was developed based upon the synthesized active ingredients and theoretical underpinnings of existing adolescent health theories/models. Chapter 4 represents the final component of the development stage of the MRC framework (Figure 4.1), presenting a theoretical understanding of how strength-based technology clubs may develop technology skills, foster self-determination, develop friendships, and improve social skills.

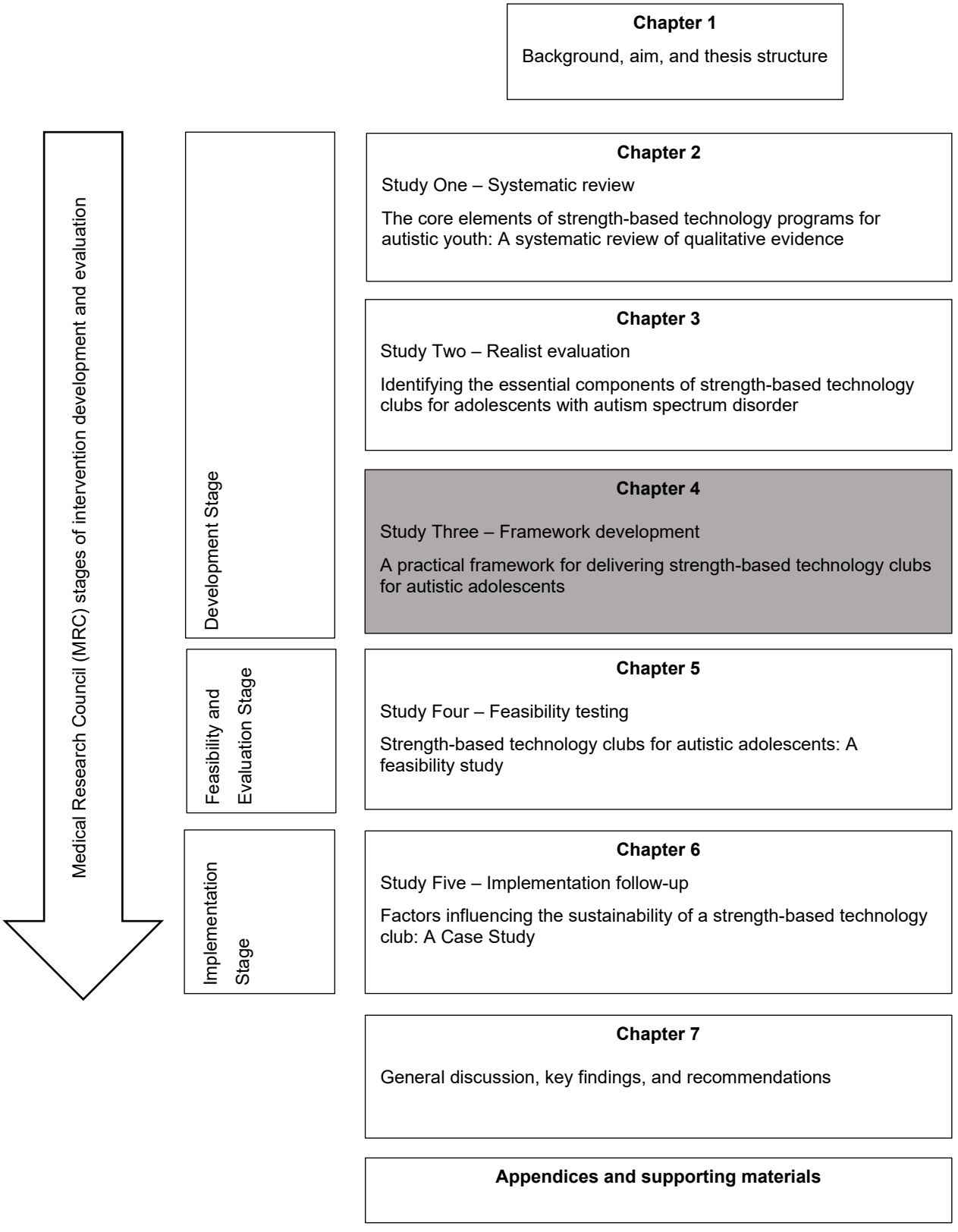

Figure 4.1 Overall thesis structure in relation to Chapter 4

Content is removed due to copyright restrictions

Chapter 5: Strength-based technology clubs for autistic adolescents: A feasibility study

This chapter has been submitted for publication.

Jones M, Falkmer M, Milbourn B, Tan T, Bölte S, Girdler S. Strength-based technology clubs for autistic adolescents: A feasibility study. Forthcoming 2021

Author contribution statement: Chapter 5

As co-authors of the paper entitled, ‘Strength-based technology clubs for autistic adolescents: A feasibility study,’ we confirm that Matthew Jones has been the principal researcher and has made the following contributions:

- Conceptualizing the research design
- Data collection, analysis, and synthesis
- Writing the manuscript
- Journal correspondence

Our contribution to the paper was consistent with the role of supervisors and involved the following contributions:

- Assistance with conceptualizing the research design
- Assistance with analysis and interpretation
- Review and editing of the manuscript

Matthew Jones (Candidate)	22nd March 2021
Professor Sonya Girdler	22nd March 2021
Dr Marita Falkmer	22nd March 2021
Dr Ben Milbourn	22nd March 2021
Professor Tele Tan	22nd March 2021
Professor Sven Bölte	22nd March 2021

Preface

Guided by the newly developed IVAR framework, Chapter 5 describes the delivery and feasibility evaluation of a 15-week strength-based technology club delivered to 25 autistic adolescents. The feasibility areas of acceptability, demand, implementation, practicality, adaptation, integration, and expansion were explored via qualitative methods. Preliminary efficacy was assessed via pretest-posttest design. This chapter aligns with the feasibility and evaluation stages of the MRC framework (Figure 5.1) and contributes to understanding the practical application of the IVAR framework. Recommendations for improving the feasibility were provided.

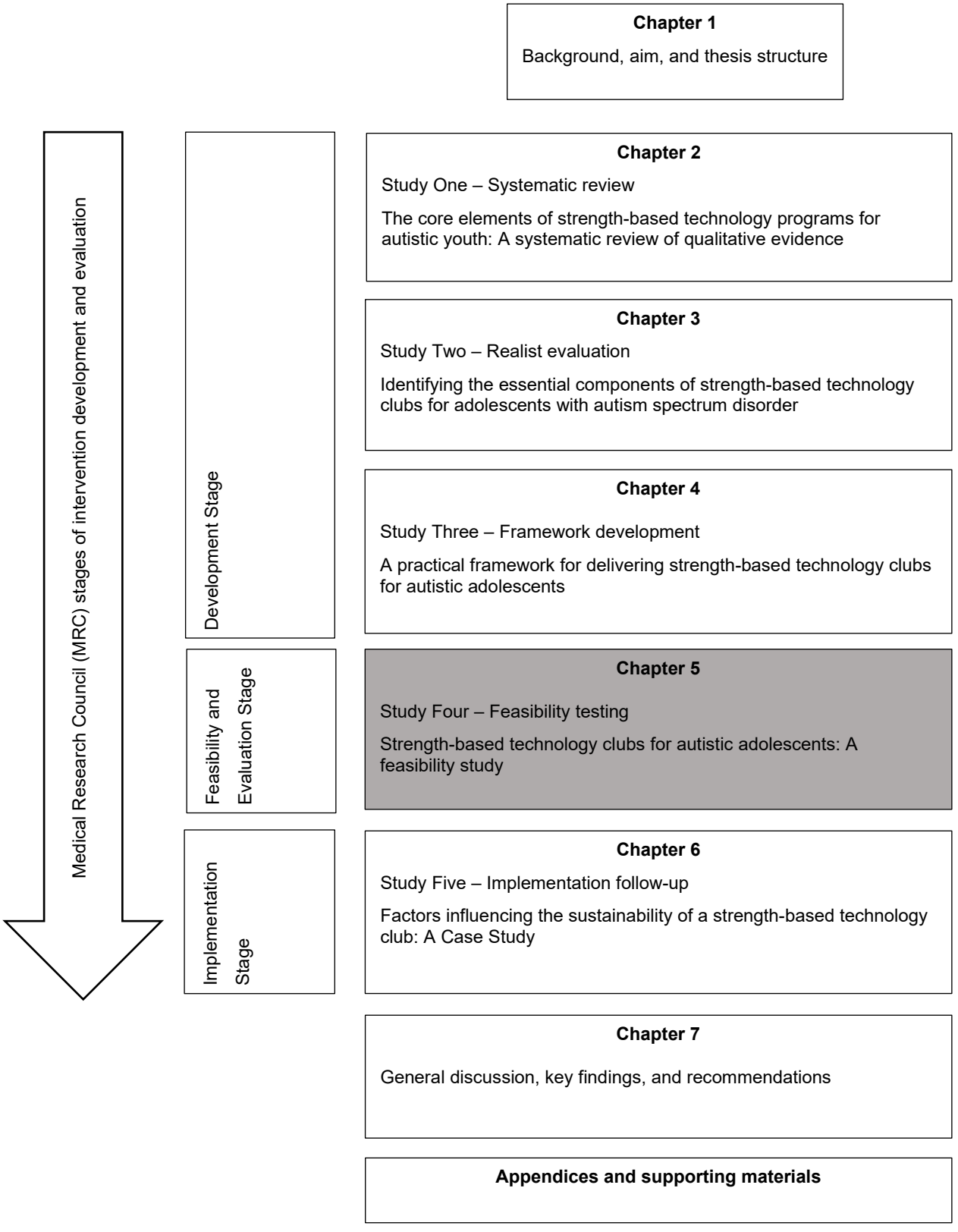

Figure 5.1 Overall thesis structure in relation to Chapter 5

Content is removed due to copyright restrictions

Chapter 6: Factors influencing the sustainability of a strength-based technology club: A case study

This chapter has been submitted for publication.

Jones M, Falkmer M, Milbourn B, Tan T, Bölte S, Girdler S. Factors influencing the sustainability of a strength-based technology club: A case study. Forthcoming 2021

Author contribution statement: Chapter 6

As co-authors of the paper entitled, 'Factors influencing the sustainability of a strength-based technology club: A case study,' we confirm that Matthew Jones has been the principal researcher and has made the following contributions:

- Conceptualizing the research design
- Data collection, analysis, and synthesis
- Writing the manuscript
- Journal correspondence

Our contribution to the paper was consistent with the role of supervisors and involved the following contributions:

- Assistance with conceptualizing the research design
- Assistance with analysis and interpretation
- Review and editing of the manuscript

Matthew Jones (Candidate)	22nd March 2021
Professor Sonya Girdler	22nd March 2021
Dr Marita Falkmer	22nd March 2021
Dr Ben Milbourn	22nd March 2021
Professor Tele Tan	22nd March 2021
Professor Sven Bölte	22nd March 2021

Preface

Chapter 6 describes a 12-month review of the strength-based technology club, which operated independently of the first author for 12-months lead by community volunteers. Separate interviews were conducted with club facilitators (*n* = 3), parents of autistic adolescents who attended the club (*n* = 2), and a university coordinator (*n* = 1), exploring factors impacting the sustainability of the club. This study completed the final stage of developing a complex intervention (Figure 6.1), providing recommendations for sustaining the delivery of strength-based technology clubs in the community and leading to further refinements of the IVAR framework.

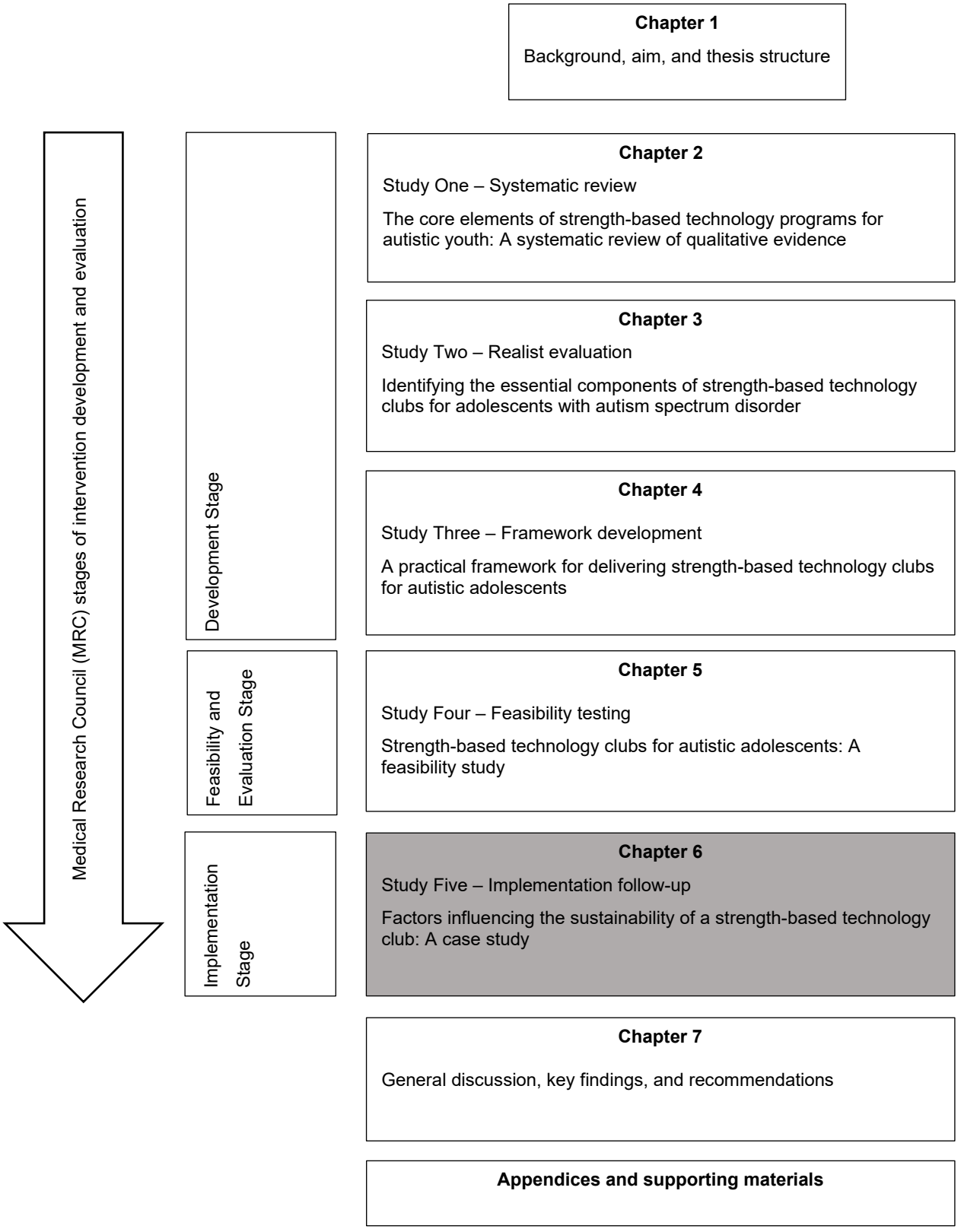

Figure 6.1 Overall thesis structure in relation to Chapter 6

Content is removed due to copyright restrictions

Chapter 7: Discussion and Conclusion

Preface

Chapter 7 synthesizes the results, providing an overview of the research findings from each study (Figure 7.1). The unique contribution of each study, limitations, and recommendations for future research are discussed. The general discussion contributes to the thesis by examining how the newly developed framework could apply to other areas of autism intervention.

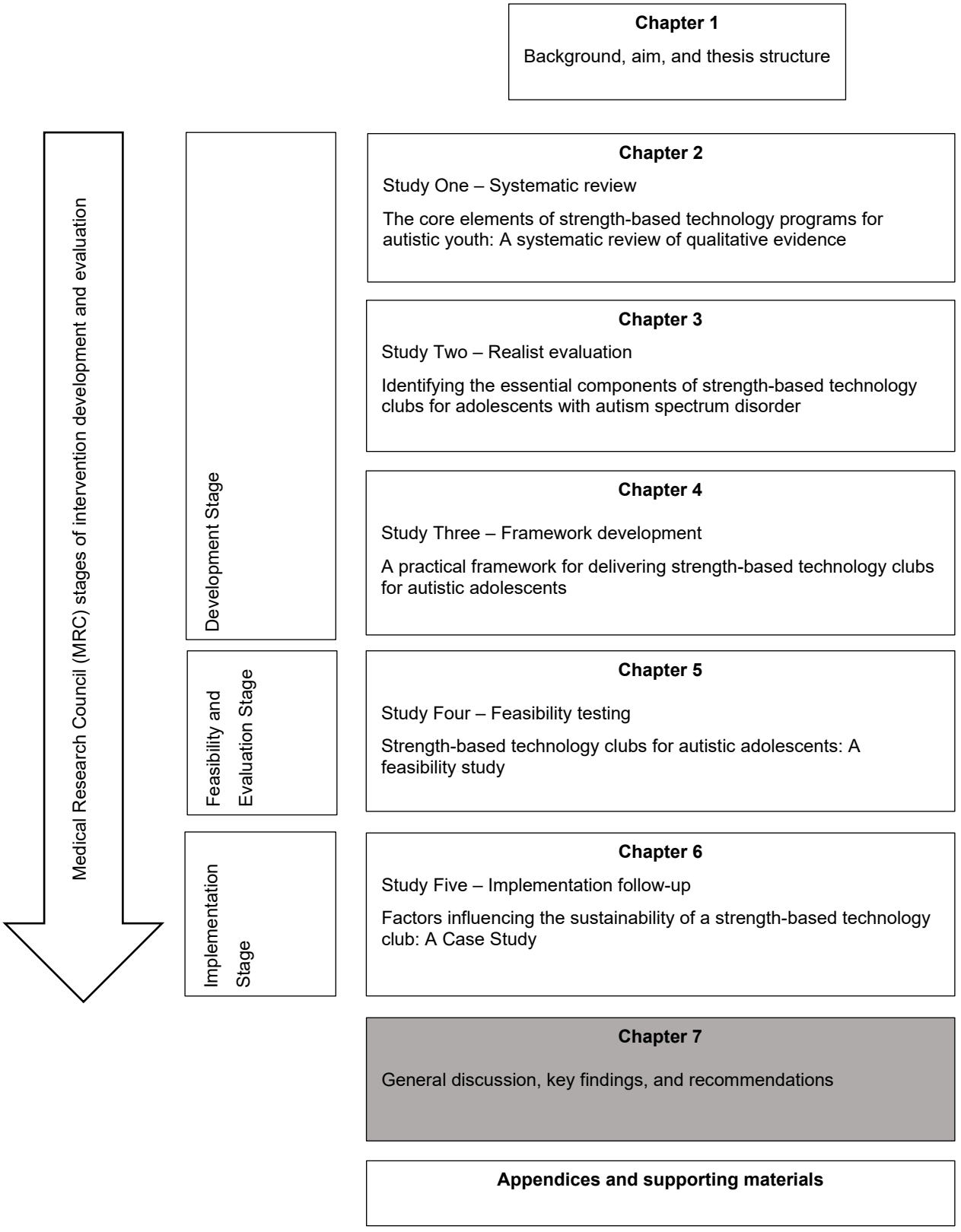

Figure 7.1 Overall thesis structure in relation to Chapter 7

Overview

Despite significant investment in early intervention (1), autistic individuals face poor outcomes in adulthood across a range of life areas including, employment (2), postsecondary education (3), community participation (4), and social participation (5). To prepare autistic adolescents for adulthood, intervention needs to progress beyond a deficit-focus and consider building positive traits required for adulthood (6). Several factors are associated with facilitating positive outcomes for autistic adolescents as they transition into adulthood, such as self-determination (6–9), peer relationships (6,10), loneliness and friendship (11–14), and career specific skills (6,8,9). Previous qualitative research investigating strength-based technology clubs have attempted to target similar outcomes (15,16). For example, a 3D-design program hoped to encourage self-determination and agency in autistic youth by ensuring adult facilitators were non-judgmental, showed students respect, and worked collaboratively (16). While the study did not conduct quantitative measures, the authors recommended that future research investigate how strength-based technology clubs may influence agency and how this in turn may impact social engagement (16). Similarly, another strength-based technology club created their program to support the development of self-determination by adopting youth-centered learning, where facilitators would provide individualized teaching based on the students interests and needs (15). The same program provided opportunity for autistic youth to explore career specific skills by learning design software used by engineers and architects (15). A number of qualitative studies have documented how friendships can be established through strength-based technology clubs for autistic youth (16,17). Facilitators of a strength-based technology club reported that autistic youth developed friendships at the club through shared interests, as autistic youth were more comfortable in talking about their interests in technology (17). Very few quantitative studies investigating strength-based technology clubs exists; however, the data mirrors the qualitative research. Quantitative research investigating strength-based technology clubs for autistic youth suggest potential improvements in social relationships, confidence and self-esteem, sense of belonging (18), and

collaborative work (19). Considering the potential benefits to autistic youth, this thesis evaluated if strength-based technology clubs impacted factors associated with positive outcomes in adulthood (i.e. self-determination, friendship, loneliness, and self-efficacy for career specific skills.) The qualitative literature surrounding strength-based technology clubs for autistic youth is promising; however, their efficacy remains mostly untested. Currently, there is no standard approach for designing and delivering strength-based technology clubs for autistic adolescents, which impacts the ability to reproduce the intervention and test efficacy. Therefore, this thesis aimed to develop and evaluate a strength-based technology club for autistic adolescents using a standardized framework. The research was guided by the Medical Research Council (MRC) Framework for developing and evaluating complex interventions (20) and divided into five studies:

Study One – Systematic review

Study Two – Realist evaluation

Study Three – Framework development

Study Four – Feasibility testing

Study Five – Implementation review

Key findings and implications

The results of this thesis have made multiple unique contributions to understanding the design and delivery of strength-based technology clubs for autistic adolescents.

1. A strength-based approach is multifaceted

Within the autism literature, the strategies that define a strength-based approach are varied. Previous strength-based technology clubs have focused on focused interests (16,17), activities that require attention to detail or visual-spatial abilities (21), developing positive traits rather than remediating deficits (16), and applying positive psychology frameworks (15). This thesis confirmed that there is no single element that defines a strength-based approach, but rather multiple strategies are employed. The strategies

described in this thesis are referred to as active ingredients or mechanisms. The systematic review conducted in Study One produced three active ingredients: mutual respect, demonstrating skills, and interests. Study Two conducted a realist evaluation of three existing technology clubs and identified three active ingredients: activity design, strengths and abilities, and the environment.

Mutual respect, as identified in Study One, related to facilitators respecting autistic adolescents as equals and adolescents respecting facilitators for their technical expertise. When mutual respect was established, adolescents' felt safe and comfortable speaking to facilitators about future education and employment opportunities. Facilitators adopted a mentor role with autistic adolescents to avoid power imbalance, treat them as individuals, and establish genuine rapport (22,23). Even though facilitators were not health professionals, they adopted a client-centered approach by minimizing power inequality and avoiding judgmental behavior (24).

Demonstrate skills, as identified in Study One, related to strength-based technology clubs, providing autistic youth opportunities to showcase their technology skills through presentation days or peer mentoring. Participation in presentation days and peer mentoring improved confidence, promoted social interaction, and reinforced a safe environment. Demonstrating skills allows peers and family members to view the autistic adolescent from a different perspective; rather than needing help with an activity, they excel and achieve (25,26). Changing parental expectations can potentially impact future education (27,28) and social outcomes (29).

Interests, as identified in Study One, related to participants sharing interests and incorporating interests into activities. Interests was an essential active ingredient in strength-based technology programs as it impacted all outcomes. Autistic adolescents socialized over a common interest, felt safe with like-minded people, developed friendships based on interests, discussed

future options using interests, and felt more confident. Interests were a powerful motivator to socialize and to engage in learning activities. The use of interests to encourage socializing, facilitate friendships, and create belonging is well supported in autism literature (29–31). Technical facilitators often shared interest with autistic adolescents, which provided an opportunity to build good rapport (22,32,33). Interest-based activities have also been used extensively to motivate and engage autistic individuals in learning activities (34–37). Restricted and repetitive interests are typically seen as deficits; however, the results indicate that interests can be leveraged to encourage positive outcomes.

Activity design, as identified in Study Two, referred to the technology activities provided. The clubs applied an individualized approach, with facilitators changing their teaching approach based on the individual. There was no set curriculum allowing facilitators to be flexible in teaching. An individualized approach considers the learning styles, sensory profiles, strengths, weaknesses, and goals of autistic individuals when teaching (38,39). The technology clubs provided autonomy by allowing adolescents to choose between multiple activities, which is recommended to increase task engagement and decrease aggressive or off-task behavior (40–42).

Study Two's strengths and abilities theme referred to using shared interests, interest-based activities, and pre-existing strengths to facilitate engagement and learning. Qualitative data showed that shared interests and interest-based activities were thematically linked to more outcomes than other active ingredients of strength-based technology clubs, reflecting the findings from Study One. Interests of autistic adolescents were a powerful motivator for socialization (29,30,43) and activity engagement (34,36).

Environment, as identified in Study Two, referred to noise and overcrowding, everyone has autism, and consistency of facilitators. Facilitators need to consider how noise and overcrowding may cause challenges for autistic

adolescents with sensory needs and how consistent facilitators help establish a preferred routine. The technology clubs did not aim to remediate autistic adolescents' sensory challenges but rather modify the environment to suit their requirements, a strategy used in later life to ensure a match between workplaces and sensory needs (7,44,45).

Overall, Study One provided three distinct active ingredients of strength-based technology classes. The power indifference between facilitators and adolescents was removed by developing mutual respect. The technology clubs did not focus on the challenges of autism but rather provided adolescents the opportunity to showcase their skills and abilities. The technology clubs reframed deficits as strengths, such as leveraging intense interests to encourage socializing or activity engagement. The results of Study Two reinforced Study One with a heavy focus on interests to facilitate socialization and activity engagement. Active ingredients relating to the design of activities and the impact of the environment were more easily identified through the ethnographic methods employed in Study Two, which otherwise would not have been identified through the literature. This thesis outlined multiple active ingredients demonstrating that a strength-based approach is multifaceted, and while leveraging focused interests of autistic individuals receives a lot of attention in the strength-based literature (29–31), this thesis identified numerous other strategies that should be considered.

2. A strength-based framework focuses on requirements for healthy adolescence rather than remediation of deficits.

Intervention that solely relies upon the medical model aim to improve function by reducing symptoms and deficits associated with autism (46). Traditionally, this approach has driven the development of interventions which focus solely on the individual as the target of change. This thesis mapped the active ingredients of strength-based technology clubs to health theories/models which adopt a holistic perspective of health and well-being. The strength-based framework produced by this thesis goes beyond symptom reduction

and explores requirements for healthy adolescence. The requirements for healthy adolescence, as described by the framework, is demonstrated in Study Three, where the active ingredients are aligned with three health theories/models: PERMA (positive emotion, engagement, relationships, meaning, accomplishments) well-being Model (47), Self-Determination Theory (SDT) (48), and International Classification of Function, Disability and Health – Children and Youth Version (ICF-CY) (49).

The PERMA model proposes that five components influence happiness and well-being: positive emotion, engagement, relationships, meaning, and accomplishments (47). The components of positive emotion, engagement, and relationships support a theoretical understanding of interest-based active ingredients. Positive emotion and engagement can be produced by incorporating focused interests into activities. This is well demonstrated within the literature, with interest-based activities increasing enjoyment, motivation to participate, and engagement in autistic individuals (34,50). The use of interests to develop relationships is also well supported, with common interests facilitating socializing, friendships, and belonging (16). The PERMA model supports the use of interests as a major component of strength-based technology clubs as they produce positive emotion, increase engagement, and help establish relationships.

The SDT (48) describes health and well-being by meeting three psychological needs: competence, autonomy, and relatedness (48). Competence represents feeling effective in achieving a desired outcome (48) and links to the active ingredients of demonstrating skills, skill development, and using strengths. Demonstrating skills encourages autistic adolescents to develop technical competence and then demonstrate those skills to others. This provided the opportunity for autistic adolescents to contribute to their family, community, and peers by sharing their knowledge and skills (51,52). Demonstrate skills challenges a deficit-based approach that prioritizes remediation of deficits and encourages exploring opportunities to witness

autistic adolescents succeeding. Developing competence was also aligned with the active ingredient of technology skill development. Within SDT, autonomy represents the experience of control over a person's behavior (53). Two activity ingredients aligned with autonomy: individualized approach and activity choice. Both active ingredients provide choice and decision-making to autistic adolescents. Relatedness from SDT describes when an individual develops connections with others and feels like they belong (53). Relatedness was primarily linked with mutual respect, as mutual respect prioritized facilitators building collaborative relationships with autistic adolescents rather than adopting an authoritarian role. Overall, the active ingredients of strength-based technology clubs aimed to satisfy the psychological needs of competence, autonomy, and relatedness rather than reduce autism symptomology.

The ICF-CY (49) emphasizes the impact of the environment on function and can be aligned with three active ingredients: noise and overcrowding, everyone has autism, and consistent facilitators. Noise and overcrowding align with the physical environment components of the ICF-CY, negatively impacting function for hypersensitive individuals. The technology clubs did not aim to improve autistic adolescents' sensory tolerance but rather modify the environment to suit their sensory needs. The active ingredients of everyone has autism and consistent facilitators, aligns with the "support and relationships" environment category of the ICF-CY. Consistent facilitators and technology clubs exclusively for autistic adolescents helped to create a supportive and safe social environment. In general, active ingredients relating to the environment focused on creating a space that suited the individual, rather than autistic adolescent changing to suit the environment.

The alignment of the active ingredients with the selected health theories/model led to the development of a new strength-based framework. The new strength-based framework is represented by the acronym IVAR: interests, value, autonomy, and requirements. Like the health

theories/models, each component is guided by improving positive traits or meeting a psychological need rather than reducing autism symptomology. Future strength-based technology clubs can be guided by the IVAR framework, with example recommendations made in Study Three.

3. A strength-based approach does not ignore autism-specific needs.

The results of this thesis emphasize that a strength-based approach includes consideration of autism-specific challenges and needs. As previously mentioned, the strength-based technology clubs did not aim to remediate deficits; however, this does not mean that autism-specific needs or challenges were ignored. This was acknowledged in the newly developed IVAR framework by the 'requirements' component. The requirements component of IVAR was underpinned by the ICF-CY, which views functioning as the interaction between the health condition, body functions, body structures, activities, participation, environmental factors, and personal factors (54). The complexity of this interaction was witnessed in Study Five, where a new activity was introduced (i.e., Minecraft), which increased communication between adolescents due to the excitement of the video game and the social components of the game, which in-turn increased noise within the classroom (i.e., physical environment), which then led to frustration for some autistic adolescents who were more sensitive to noise (i.e., body function). The medical model would aim to improve autistic adolescents' body function (i.e., hypersensitivity). In contrast, the ICF-CY provides an opportunity to improve function by modifying the activity (i.e., Minecraft) or modifying the environment (i.e., changing the physical space to reduce noise). The newly developed IVAR framework captures this approach and requires future strength-based technology clubs to manage autism-specific needs through modifying the social and physical environment.

4. Technology clubs have the potential to improve social communication skills for autistic adolescents.

Qualitative results from Study One (systematic review), Study Two (realist evaluation), and Study Four (feasibility study) all documented social and communication benefits, such as reciprocal conversations, approaching people, collaborative working, problem-solving with others, making friends, listening to others, presenting their work in a group situation, and teaching others. Study Four (feasibility study) also demonstrated quantitative improvements in interpersonal efficacy. While the outcomes associated with strength-based technology clubs are preliminary, they provide a potential pathway to improve social communication skills in autistic adolescents. Social skill groups are a common intervention for autistic adolescents (55); however, the results of this thesis demonstrated an indirect approach to improving social communication skills by providing an environment where like-minded people can share interests. Further research is required to understand better if this indirect approach which leverages interests, can achieve similar social outcomes as more direct social interventions. While strength-based technology clubs have the potential to impact social communications outcomes they should not become its exclusive purpose. Doing so, may encourage a remedial approach mindset, neglecting the development of positive factors, such as building self-determination or confidence.

5. Strength-based technology clubs and neurodiversity

Study Two (realist evaluation) demonstrated that autistic adolescents felt that they belonged to a group because the technology club was exclusively for autistic adolescents. Forming a group identity through diagnosis reflects neurodiversity principles, where autism is celebrated and considered an inherent part of an individual’s identity (46). Equipping autistic adolescents with a sense of belonging is deemed to be essential for transitioning to adulthood (6) and protects them from depression and anxiety in the future (56). Study Five (implementation study) reinforced Study Two's findings, where an autism diagnosis created feelings of belonging for adolescents. While the club supported the broad concept of neurodiversity through celebrating the autism diagnosis, it did not necessarily extend to other

neurological diagnoses. Study Five's results revealed that parents were concerned at the prospect of allowing children with other neurological diagnoses to attend the club, believing it would impact the feelings of belonging and safety. The impact of expanding the club to include neurodiverse students, not just autistic adolescents, is currently unknown; however, it is predicted that a safe social environment accompanied by feelings of belonging can be maintained through shared interests (15,17,57).

6. Strength-based technology clubs require a collaborative approach with the autistic community

Study Five (implementation study) reinforced the value of autistic facilitators. Autistic facilitators can be valuable mentors by sharing their own experiences and normalizing mentees' experiences (23). Parents commented on how autistic facilitators had a better understanding of the challenges they face. Within the literature, autistic mentors have been utilized to support autistic college students in developing self-advocacy skills (58,59). Further, autistic mentors have also been shown to apply an individualized approach to autistic mentees (59) and create a sense of belonging and community (58). When delivering 3D design courses, autistic mentors were motivated to help autistic students because they had a greater understanding of the challenges of living with autism (60). While autistic adolescents and facilitators participated in qualitative data collection throughout this thesis, participatory design principles could further enhance the club's development. Participatory design goes beyond autistic individuals being the subject of research and actively involves them as collaborators in designing and developing interventions (61). Future strength-based technology clubs can increase participatory design by ensuring autistic members are involved with organizational decision making, providing online text-based collaboration options (e.g., email, forum, social media group), explore a modified voting system to ensure autistic members are heard during decision making, and introduce strategies during in-person meetings to ensure conversations remain on topic and increase the time provided to answer questions (61).

Participatory design represents a collaboration between all stakeholders, which was reinforced in the results of Study Five. Study Five reinforced the importance of club champions and community partnerships. For the technology club to grow, it required a community partnership between the technology club, a secondary school, and a university. The club champion, who did not have autism, coordinated and communicated with each stakeholder. The autistic facilitator represented in Study Five commented how he preferred not to have the role of club champion due to the level of communication required. While the autistic facilitator may not want to be directly involved in coordinating community partners, the autistic facilitator should be provided with communication methods that suit his preference to ensure his involvement in the decision-making process. While these recommendations are appropriate for this individual autistic facilitator, it cannot be applied to all future autistic facilitators. Effective collaboration with autistic members based on their individual preferences requires more attention in the future growth of the strength-based technology club.

Summary of unique contributions

This thesis has made a unique contribution to understanding the design and delivery of strength-based technology clubs for autistic adolescents. The results have demonstrated that strength-based technology clubs are multifaceted with numerous active ingredients, focus on requirements for healthy adolescence, acknowledge autism-specific needs and challenges, have the potential to improve social communication outcomes, support neurodiversity, and require a collaborative approach with the autistic community.

Recommendations

The thesis results provided a strength-based framework that can be used to design and deliver future strength-based technology clubs for autistic

adolescents. The remainder of this chapter provides details of how the IVAR strength-based framework can be applied to clinical practice and future research.

Clinical practice recommendations

The results indicated that a strength-based approach is more complicated than just prioritizing strengths over deficits and involves various strategies. While the framework was developed from technology-based classes, the general principles can be applied to a strength-based approach in autism service provision. The IVAR framework of interests, value, autonomy, and requirements can be used to guide a strength-based approach in other areas. The IVAR framework's sustainability factors are also discussed; club champions, expert facilitators, and collaborative partnerships.

Interests

The thesis demonstrated both strengths and challenges with incorporating the interests of autistic adolescents. Interests can be leveraged to motivate socialization and activity engagement (36,37,43,62); however, they can also have the opposite effect interfering with learning and socializing (63). Study Five's results somewhat reinforced this, with learning opportunities decreasing with the use of a Minecraft activity. While facilitators felt learning opportunities fell, socialization increased with autistic adolescents engaging in conversations surrounding Minecraft. The Minecraft activity's challenges were thought to be related to the activity being too closely aligned with the adolescent’s interest, making it difficult to refocus students. It is recommended that service providers select their learning platforms and software first and then modify activities to incorporate interests rather than using the direct interest in teaching and learning. This was achieved in the technology clubs by having flexible video game development software, such as Construct 2 (64). Construct 2 (64) provided a ‘blank canvas’ where students could make a video game about any interest. One student made a mathematics game, another student made a car racing game, while another

student made a platforming game. All facilitators were educated on how to use Construct 2 so that they could assist students in incorporating their interests into the activity.

Previous research showed that autistic individuals avoided socially orientated interests (65); however, the social aspects of Minecraft were one of the most popular activities. A potential advantage of the strength-based technology clubs is that the clubs center on a common and genuine interest in technology, naturally encouraging socializing. The club was not promoted as a social skills group for autistic adolescents but rather a technology club. A social skills club centers on the social deficits associated with autism and does not necessarily facilitate the gathering of adolescents with similar interests. Common interests were not just shared between adolescents, but facilitators and autistic adolescents often shared interests. The facilitators were not health professionals but rather technology experts supported by a health professional through the research team. By design, technology clubs provided a space where people who shared an interest in technology could socialize. The broad appeal of technology motivated autistic adolescents to attend the club initially, with activities further modified based on individual interests. The results can be applied to clinical practice by building programs based on a broad central interest, identifying individual interests of participants, modifying activities to incorporate individual interests, and recruiting expert facilitators who may share interests with autistic adolescents.

Value

At its core, strength-based technology clubs value autistic individuals. The IVAR framework encourages service providers to avoid solely focusing on deficits and instead incorporate strategies that demonstrate the value of autistic individuals. Facilitators showed that they valued autistic adolescents by building technology competence, providing opportunities to showcase their skills, and using their strengths. The technology club applied

neurodiverse thinking (46,66), where facilitators did not view autistic adolescents as needing a ‘cure’ or to be ‘treated.’ Neurodiverse thinking encourages service providers to consider all aspects of the individual, including strengths and differences (46), and more broadly what is required for healthy adolescent development and transition into adulthood. The value component of IVAR can be applied throughout the intervention process in autism. For example, therapy assessment is often heavily deficit-based (67), yet therapists should identify strengths, abilities, and interests. Goal setting can move beyond the reduction of autism symptoms and progress to developing positive attributes like self-determination, connection with others, and confidence (67). The results challenge intervention solely focusing on remediating deficits, and encourages service providers to demonstrate the value of autistic individuals.

Autonomy

The IVAR framework is further separated from the medical model due to its focus on autonomy. The medical model creates a power difference between therapist and patient, as the patient is inherently considered to have reduced capacity, leading to health professionals or family members making decisions (46). Oppositely, within technology clubs, facilitators adopted an individualized approach, developed a mutual respect, and encouraged activity choice.

To support an individualized approach, future services should complete a pre-assessment before adolescents attend. Information on autistic adolescents’ strengths, interests, preferred learning strategies, and previous activity experiences should be placed on a quick reference profile card to increase accessibility. Further, classes can be divided into smaller groups to increase familiarity between facilitators and adolescents. The use of smaller learning groups may help build rapport, provide more one-on-one learning (68), and create peer learning opportunities (69).

Mutual respect between facilitators and adolescents also supported autonomy. Mutual respect demonstrated the importance of recruiting facilitators with expert backgrounds as autistic adolescents admired technical skills (15–17). The results challenge autism interventions delivered via a health professional and encourage health professionals to adopt a coordinator role while technical experts provide the program.

To support activity choice, each autistic adolescent was provided with an individual laptop which was provided by an industry sponsor. Additional hardware was also purchased, such as robots, to increase the range of technology activities available. It was initially predicted that individual laptops would facilitate greater autonomy by allowing a wider range of computer software to be installed. This would give facilitators greater freedom in following the interest of adolescents. Previous technology clubs (70) accessed computer laboratories of schools or tertiary institutions were limited in what programs they could install, limiting autonomy for adolescents. The hope was that task engagement would increase with greater choice, and challenging behavior (e.g., aggression, impulsivity, off-task, opposition) would decrease (40–42,71). While individual laptops were planned to increase autonomy, they limited the practicality of the technology club. Facilitators spent increase time fixing individual laptops, installing updates, or general maintenance of the laptops. The results encourage caution when increasing autonomy for autistic adolescents and display the potential impact on the practicality of autism services.

To further support autonomy, autistic adolescents were able to choose from multiple technology activities. However, similar to the provision of individual laptops, this also impacted the practicality of the club. Facilitators felt that they did not have the technical expertise to teach multiple activities. The results indicated that increasing choice for adolescents increased practicality challenges. A balance needs to be achieved between providing activity choice to adolescents and ensuring that facilitators are not overwhelmed with

the technology activities offered. Having a smaller selection of activities, increasing facilitator training, or introducing activities that facilitators are already skilled in is recommended to increase the practicality while maintaining autonomy. In addition, facilitators were more critical of their technology knowledge than autistic adolescents; adolescents commented on how helpful and friendly facilitators were. Facilitators would benefit from increase training in a collaborative approach, where it is encouraged to learn with the student rather than having all the answers (15).

The results encourage service providers to adopt an individualized approach, develop mutual respect, and provide activity choice. However, a balance needs to be achieved between activity choice and practicality, as the results showed providing more opportunities for autonomy made the activities more challenging for facilitators to deliver.

Requirements

The requirements component of IVAR is a reminder that even when providing strength-based services, the environmental needs of autistic adolescents cannot be ignored. This approach considers function in autism as a product of personal, social, and environmental factors (72). The technology clubs did not aim to remediate the sensory challenges of autistic adolescents but rather create a better person-environment fit, similar to what has been seen in employment research (73,74). A strength-based approach does not exclude providers from modifying the environment to better suit the individual. The requirements component also demonstrated the need for a safe and supportive social environment. This was achieved through autism exclusive clubs where adolescents reported belonging through their autism identity. It is predicted a graded approach to introducing non-autistic adolescents who are genuinely interested in technology could maintain a supportive social environment. Service providers should prioritize the feeling of belonging and like-mindedness, which can be achieved by focusing on common interests (15,17,57).

Club champions

Club champions represented facilitators that focused on organizing, coordinating, and expanding the technology club. Club champions had a strong network within the local community and were driven by a mix of internal and external motivations. Club champions demonstrated a positive feedback loop of social capital, where volunteering produces community networks and socially connected people are more likely to volunteer (75,76). The sustainability of strength-based technology clubs is impacted by club champions who lead and improve the club by leveraging strong community networks. Typically, a health professional would oversee and coordinate an autism service; however, this thesis provides an example of community members adopting a leadership role. Therapists should consider how to engage leaders in the local community who could adopt the role of club champion.

Expert facilitators

Unsurprisingly, the sustainability of the club is dependent on recruiting and retaining expert facilitators. Autistic facilitators were valuable assets sharing their lived experience with autism while excelling in technical knowledge. Delivery of the technology clubs was reliant on volunteers, mimicking Australia's reliance on volunteers for sporting clubs (75,77). Facilitators considered volunteering at the technology club no different from volunteering at the local sport club. However, considering this thesis hoped to contribute to improving adulthood outcomes for autistic individuals, including employment outcomes, it could be considered hypocritical that autistic facilitators were not paid. Future technology clubs aiming to employ autistic facilitators will need to consider if families pay a fee to attend the club or if the club is funded by the National Disability Insurance Scheme (NDIS). The NDIS represents the government funding provided to Australians with a disability (78). If approved, autistic adolescents and their families could use their NDIS funding to pay for attendance at the club, similar to how they

would pay for therapy sessions. It is not known how changing the club from a volunteer model to a fee-for-service model would impact the culture and expectations of the club. For example, if parents spend their NDIS funding on the club they may expect more therapeutic outcomes. Autism service providers should consider a mix of autistic and non-autistic facilitators, with future research required for the delivery of fee-for-service technology club.

Collaborative partnerships

The theme of collaborative partnerships represented the dynamic interaction between the technology club, a secondary school, and a university. The technology club provided a catalyst for a school-university partnership (79) where all stakeholders benefited. The technology club received increased resources, the school could develop alternative learning pathways for neurodiverse students, and the university can facilitate more research. The results encourage autism services to consider partnerships with schools and universities to form collaborative relationships that benefit all stakeholders.

Additional research

Future research should investigate developing strength-based assessment frameworks, rigorous testing of the IVAR framework through randomized controlled trials, further testing sustainability factors, and exploring the long-term benefits of technology club participation.

This thesis created a strength-based measurement framework to account for the lack of standardized strength-based assessments (67). Measurement of positive traits, such as self-determination, were selected due to their predictive nature of positive outcomes in adulthood (6,80,81). Future research should explore defining strength-based assessment for autistic adolescents by applying the thesis's measurement framework with a larger sample size. Assuming statistical significance is achieved, the measurement framework can be further reviewed and modified.

Future research should focus on more rigorous testing of strength-based technology clubs. A randomized control trial (RCT) is recommended with the intervention guided by IVAR framework (82). Currently, the studies identified in this thesis were mostly qualitative (15–17), and the strategies implemented under a strength-based approach were vague and varied. The IVAR framework provides a standardized approach to designing and delivering technology clubs for autistic adolescents. A RCT will offer the first evidence that technology clubs can build the positive traits needed for adulthood and demonstrate that a strength-based approach can improve adulthood outcomes for autistic individuals. Overall, quantitative data lacked significance in this thesis, potentially due to the sample size; however, qualitative themes consistently related to socializing and friendship. For this reason, social outcomes such as friendship and loneliness scales, should continue to be evaluated. Considering the potential impact on social outcomes, future RCT research could consider a social skill group training (SSGT) program as the control group. SSGT are delivered by therapists to groups of autistic children or adolescents with a structured lesson plan, typically starting by introducing of a specific social skill, followed by the therapist modelling the targeted social skill, participants practice the use of specific social skills through role playing, individual feedback on skill use and ending with a group discussion (55). SSGT relies upon learning and practicing specific social skills which aims to impact social functioning as the skills are generalized to scenarios outside of the social skill program (55). Previous RCTs have investigated the effects of SSGT on social competence, friendship quality, and loneliness, among other social outcomes (55). Strength-based technology clubs and SSGT fundamentally have different learning approaches, yet their outcomes are comparable. Strength-based technology clubs are aligned with implicit learning, whereas SSGT are aligned with explicit learning. Implicit learning is not a conscious decision and occurs incidentally when interacting with complex social situations (83). Explicit learning is conscious learning, with structured lessons targeting a specific skill (83,84). The literature displays mixed results regarding implicit

learning for autistic individuals, with some studies reporting intact implicit learning (83–86), while other studies involving infants found reduced neural evidence for implicit learning, specifically relating to language (87). A RCT of strength-based technology clubs may provide increased evidence for implicit social learning. Future strength-based technology clubs that focus on social and communication outcomes may seem counter-intuitive to a strength-based approach; however, this thesis provides clear guidelines for the use of strength-based strategies. For example, using common interests between autistic adolescents to facilitate socializing and collaboration.

Another potential control group that could be used in future RCTs relates to transition programs, specifically interventions that aim to improve self-determination. Self-determination is very prominent in the transition service literature as it is considered a predictive factor for positive employment and education outcomes in adulthood (9,81,88). However, within the Australian context, it would likely be challenging to find a control group of autistic adolescents participating in other transitional programs due to the overall reduced engagement in transitional services (89,90). Strength-based technology clubs may be in a unique position due to the increased motivation of some autistic adolescents to engage with technology. As this thesis was primarily focused on defining and evaluating a strength-based technology club, future research should compare the suggested strategies with other self-determination interventions. A strength-based technology club that is highly focused on improving self-determination would make a significant contribution to transition research for autistic adolescents.

Further investigation into the recruitment and retainment of autistic and non-autistic facilitators is required. While some examples have been provided, specific differences between recruiting and retaining autistic and non-autistic facilitators are unknown. Future research should provide a detailed review of volunteer literature (91–94) and follow-up qualitative studies with autistic volunteers (60). Understanding what motivates individuals to volunteer

initially and what factors impact volunteers' retention will significantly contribute to sustainable technology clubs.

Qualitative data from Study Five revealed two potential challenges to the IVAR framework: neurodiverse students and intense interest. The technology club has planned to expand to include neurodiverse students, not just autistic adolescents. Further research is required to determine whether feelings of safety and belonging can be maintained when the club accepts non-autistic students. It is thought that shared interests will form the catalyst for belonging rather than diagnosis (15,17,57). The theme of intense interests also presented a challenge to the IVAR framework. While previously, interests were leveraged to increase motivation and engagement in learning activities, there is potential that the intensity of some interests will negatively impact learning (63). Further, strength-based technology clubs indirectly benefited social and communication skills as autistic adolescents developed friendships over common interests. Future research is recommended to provide guidance on using interests to benefit learning and social engagement while avoiding the negative impacts of intense interests.

Perhaps the greatest strength of this thesis was that the technology club continued to operate independently within the community without the first author’s assistance. Autistic adolescents continued to attend the technology club for over 12 months, and future research should investigate the long-term outcomes of participating in technology clubs. This thesis's technology club has continued to expand and has collaborated with the host secondary school to provide more formal pathways into tertiary education and employment. Other strength-based technology clubs have taken a similar approach, where the club's network has assisted with work experience opportunities (70). Future research should capture improvements in positive traits required for adulthood and the ability of technology clubs to provide alternative pathways to tertiary education and employment.

Limitations

The limitations of the thesis can be summarized by the research design, sample, and measurement framework.

Research design

Studies One, Two, Four, and Five had limitations relating to qualitative methods and analysis. Study One employed meta-ethnography has low reproducibility due to the time-consuming nature of data familiarity, extraction, and analysis (95). The subjective nature of data analysis further impacts reproducibility (96). Low-quality articles are not excluded in meta-ethnography as they can contribute to thematic findings and do not negatively impact results as seen in quantitative synthesis (95). The meta-ethnographic results are overrepresented by higher-quality studies that present exemplar quotes and, therefore, may not capture the full experience of autistic adolescents (96). Finally, the themes generated in this systematic review were not produced from raw data but rather reinterpreted from data already analyzed, and once again may not represent the full experience (97).

The ethnographic approach used to collect qualitative data in Studies Two and Four was time-intensive (98,99), with the first author observing and participating in multiple technology clubs over many months. The first authors' immersion and prolonged exposure to multiple technology clubs make the results difficult to reproduce and increase the subjectivity of data analysis, as the interpretation of data is based on the first author's experiences (98). The potential lack of generalizability is a limitation of the ethnographic approach (98), as the experiences captured may not apply to technology clubs in other contexts. While Study Five did not apply an ethnographic approach, the first author's experiences impacted data collection and analysis.

The heavy focus on qualitative research in this thesis was justified as it attempted to identify the active ingredients of strength-based technology clubs guided by the MRC framework for developing and evaluating complex health interventions (20). The qualitative approach allowed the researchers to understand 'how' an intervention produces change and not just 'if' an intervention is effective.

Sample

Several limitations have been identified regarding the sample, specifically transferability of results and sample size. In Study Two, qualitative data was gathered from three different strength-based technology clubs that already provided a service to autistic adolescents. Demographic data, including diagnostic information, was collected via parent report rather than citation of medical records or performing the Autism Diagnostic Observation Scale (ADOS) (100). When recruiting autistic adolescents from the pre-existing technology clubs, this thesis promoted a focus on strengths, and so it seemed counter-intuitive to start the researcher-participant relationship with a medical focus, either through citing medical records or performing diagnostics assessments. Parent-reported diagnostic information, IQ, and comorbidities impacted the transferability of qualitative results. Similarly, in Study Four, demographic data were also collected via parent report. Study Four involved creating a brand-new technology club, which started with parent information sessions and advertising within the local community. The overall message during the recruitment phase was a focus on the strengths and abilities of autistic adolescents, and so the researchers felt it detrimental to the researcher-participant relationship to begin with a deficit focus on diagnostic criteria. Forming the most accurate description of the sample is required to support transferability in qualitative studies (101). As diagnostic information was primarily parent-reported the transferability was lessened. For example, parents may have forgotten to report a comorbidity, incorrectly reported a diagnosis, used a vague or incorrect acronym, or used outdated diagnoses, such as high-functioning autism, which is no longer considered an autism diagnosis. Balancing the requirements of research, such as citing

medical records or performing more clinical-based assessments, such as the ADOS (100), is challenging when promoting a program that focuses on strengths rather than deficits.

The sample size was also identified as a limitation for Study Four and Study Five. Recruitment of participants for Study Four was limited by the resources available. Study Four received a funding grant to purchase hardware and software for the technology club, which included individual laptops for autistic adolescents to use. The number of laptops and the physical space available limited how many participants could be recruited. The limitations in resources, combined with participant drop out and participants declining to participate in research, resulted in a small sample size. Consequently, this limited statistical significance in quantitative results and therefore impacted the conclusions that can be drawn from pre-test post-test data. The sample size for the qualitative interviews performed in Study Five is also considered a limitation. Study Five commenced at 12 months post Study Four and conducted separate interviews with a facilitator, a parent, and a university coordinator. While the interviews provide valuable insight into how the technology club has continued for 12 months, it does not represent the full experience of parents or facilitators, including autistic facilitators, at the technology club. Further, autistic adolescents were not interviewed during Study Five, missing an opportunity to gather data on sustainability factors according to autistic adolescents. While the sample size was a limitation, efficacy testing was not the primary aim of this thesis.

Representation of autistic voices

Autistic individuals were involved throughout the thesis were possible. Study Three which described the theoretical development of the strength-based framework, was the only study to not actively include autistic individuals. However, Study Three drew from the results of Study One and Study Two, which both included the perspective of autistic individuals. Despite best efforts to involve the autistic community in research, the autistic voice was at

times overpowered by the experiences and opinions of non-autistic participants. This issue was especially noticeable when providing exemplar quotes. Exemplar quotes were provided in a table format and aim to provide the reader with a clear example of a theme. While many themes were identified by autistic and non-autistic participants, non-autistic quotes were often better suited exemplar tables. For example, both parents and autistic adolescents commented on the importance of shared interests in making friends; however, parents were able to convey this concept in a single sentence, whereas, when interviewing autistic adolescents, it was often more of a dynamic conversation that revealed this theme. Consequently, quotes from non-autistic participants provided more effective exemplar quotes of themes. To compensate for this, autistic quotes were represented in the main body of the thesis as more context could be provided. Despite this, it is acknowledged that it may be that the autistic voice has been less represented than the non-autistic voices.

Measurement framework

The primary aim of implementing the pre-test post-test measurement framework in Study Four was to explore the measurement framework's feasibility. Autism-related assessments typically focus on improvements in deficits (67), and consequently, a strength-focused measurement framework was created. The measurement framework primarily focused on improving traits associated with positive outcomes in adulthood, such as self-determination, self-efficacy, and friendship. In addition, a domain-specific self-efficacy scale was created. Not all of the included measures had previously demonstrated psychometric properties with autistic adolescents, limiting the validity and reliability of the results. Study Four tested the feasibility of the measurement framework rather than the efficacy of technology clubs, and consequently, caution should be taken to interpret quantitative results.

Summary and conclusions

This thesis described the development and evaluation of a strength-based technology club for autistic adolescents. Some autistic individuals' strengths are well-matched with technology-based tasks, leading to an interest in how technology clubs could improve employment outcomes for autistic adolescents. While limited, several strength-based technology clubs for autistic adolescents can be seen in the literature; however, most are qualitative. The qualitative data provided within the literature for strength-based technology clubs primarily describes the experiences of autistic adolescents and their families; however, the intervention description is varied and vague, with limited guidelines on how to reproduce strength-based technology clubs. While qualitative data suggests promising results for strength-based technology clubs, efficacy testing cannot take place until a framework is developed that guides a standardized delivery of the intervention. In developing and evaluating a strength-based technology club for autistic adolescents, this thesis created the IVAR framework to standardize the approach. The IVAR framework guides the design and delivery of strength-based technology clubs through the four components of interests, value, autonomy, and requirements. This thesis's results provided the foundation needed to proceed with more rigorous efficacy testing of strength-based technology clubs.

Current literature exploring strength-based technology clubs for autistic adolescents is primarily qualitative, and through exploring the experiences of autistic adolescents and their families, the literature suggests potential benefits to include improving self-confidence, providing opportunities to socialize, and helping to make friends (102). Anecdotal evidence within the Australian context suggested that technology clubs could also help prepare autistic adolescents for employment within the Information and Communication Technology (ICT) industry (103). Further, some of the reported strengths of autistic individuals are well matched with technology task within ICT industry (72,104–107). Strength-based technology clubs demonstrate a clear example of clinical work preceding research, as there is

a clear lack of standardization in the design and delivery of the intervention. While the potential benefits have been suggested in qualitative data, there is little understanding to how exactly a strength-based technology club could improve outcomes for autistic individuals. This thesis aimed to provide the foundation for quantitative testing by employing the MRC framework (20) for developing and evaluating complex interventions. Consequently, there is a heavy qualitative focus in determining 'how' an intervention works, rather than quantitative testing focusing on 'if' an intervention works. The components that define 'how' an intervention produces change are referred to as the active ingredients. A systematic review was performed to determine the active ingredients of strength-based technology clubs. The results of the systematic review were expanding on through an examination of currently existing technology clubs. Despite limited research, autism service providers are currently providing technology clubs for autistic adolescents, which provided a unique opportunity to explore technology clubs through ethnographic methods. A comprehensive list of active ingredients was identified through reviewing the literature and reviewing existing autism practice. The active ingredients were converted to a set of principles by comparing the results to other health theories; the resultant product was the IVAR framework. The IVAR framework was applied to design and deliver a new strength-based technology club with its feasibility tested. The IVAR framework's feasibility was proven, and the technology club has continued to operate for over 12 months without the researcher's assistance. An implementation follow-up study was completed, providing further advice to the implementation of the IVAR framework.

While the IVAR framework was created through investigating technology clubs, the principles can potentially be applied more generally to a strength-based approach in autism. Within the literature, studies often report the use of a "strength-based approach;" however, very few details are given to the strategies employed. This thesis challenges the current use of "strength-based approach" in autism research, suggesting that applying a strength-based approach involves more than a single strategy. The IVAR framework

has the potential to guide future strength-based research in autism through its four components: interests, value, autonomy, and requirements. The sustainability of future strength-based technology clubs is impacted by club champions, expert facilitators, and collaborative partnerships.

This thesis has made a unique contribution to understanding the design and delivery of strength-based technology clubs for autistic adolescents. Specifically, the results demonstrated that strength-based technology clubs are multifaceted with multiple active ingredients, focus on building positive traits required for healthy adolescence rather than remediate deficits, acknowledge and accommodate autism-specific needs, have the potential to improve social communication outcomes, support neurodiversity, and require a collaborative approach with the autistic community.

In summary, this thesis provides the foundation for the design and delivery of strength-based technology clubs for autistic adolescents. Future research can now focus on demonstrating the efficacy of strength-based technology clubs using the IVAR framework to standardize their delivery. Standardized delivery would involve training facilitators and service providers to apply the IVAR framework, followed by a fidelity assessment. The IVAR framework often requires facilitators to apply a set of principles to the individual autistic adolescent, which would require initial training and feedback. The qualitative data suggests that technology clubs positively impact autistic adolescents; however, quantitative evidence remains scarce. It is acknowledged that not all autistic individuals have an affinity for technology; however, the IVAR framework sets an example of applying a strength-based approach within the technology context. Using a strength-based approach is not about ignoring the very real challenges associated with autism but rather ensuring equal attention is given to developing positive traits needed for adulthood.

Perhaps, this thesis's greatest achievement was the creation of a technology-club, integrated within the community, where autistic adolescents felt like they belong.

Belonging doesn’t require us to change who we are; it requires us to BE who we are.— Brené Brown

References

1. French L, Kennedy EMM. Annual research review: Early intervention for infants and young children with, or at-risk of, autism spectrum disorder: a systematic review. J Child Psychol Psychiatry [Internet]. 2018 Apr 20 [cited 2021 Mar 24];59(4):444–56. Available from: https://onlinelibrary.wiley.com/doi/abs/10.1111/jcpp.12828

2. Roux AM, Shattuck PT, Cooper BP, Anderson KA, Wagner M, Narendorf SC. Postsecondary employment experiences among young adults with an autism spectrum disorder. J Am Acad Child Adolesc Psychiatry [Internet]. 2013 Sep [cited 2021 Jan 1];52(9):931–9. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0890856713003778

3. Shattuck PT, Narendorf SC, Cooper B, Sterzing PR, Wagner M, Taylor JL. Postsecondary education and employment among youth with an autism spectrum disorder. Pediatrics [Internet]. 2011;129(6):1042–9. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3362908/pdf/peds.2011-2864.pdf

4. Myers E, Davis BE, Stobbe G, Bjornson K. Community and social participation among individuals with autism spectrum disorder transitioning to adulthood. J Autism Dev Disord [Internet]. 2015 Aug 1 [cited 2020 Aug 10];45(8):2373–81. Available from: http://link.springer.com/10.1007/s10803-015-2403-z

5. Orsmond GI, Shattuck PT, Cooper BP, Sterzing PR, Anderson KA. Social participation among young adults with an autism spectrum disorder. J Autism Dev Disord [Internet]. 2013 Nov 25 [cited 2020 Nov 17];43(11):2710–9. Available from: http://link.springer.com/10.1007/s10803-013-1833-8

6. Test DW, Smith LE, Carter EW. Equipping youth with autism spectrum disorders for adulthood: Promoting rigor, relevance, and relationships. Remedial Spec Educ [Internet]. 2014 Mar 6 [cited 2021 Mar 24];35(2):80–90. Available from:

http://journals.sagepub.com/doi/10.1177/0741932513514857

7. Hendricks DR, Wehman P. Transition From School to Adulthood for Youth With Autism Spectrum Disorders. Focus Autism Other Dev Disabl [Internet]. 2009 Jun 24 [cited 2020 Jul 5];24(2):77–88. Available from: http://journals.sagepub.com/doi/10.1177/1088357608329827

8. Wehman P, Schall C, Carr S, Targett P, West M, Cifu G. Transition from school to adulthood for youth with autism spectrum disorder. J Disabil Policy Stud [Internet]. 2014 Jun 11 [cited 2020 Jul 5];25(1):30–40. Available from: http://journals.sagepub.com/doi/10.1177/1044207313518071

9. Lee G, Carter EW. Preparing transition-age students with high-functioning autism spectrum disorders for meaningful work. Psychol Sch [Internet]. 2012 Dec;49(10):988–1000. Available from: http://doi.wiley.com/10.1002/pits.21651

10. Orsmond GI, Krauss MW, Seltzer MM. Peer relationships and social and recreational activities among adolescents and adults with autism. J Autism Dev Disord [Internet]. 2004 Jun [cited 2020 Apr 30];34(3):245–56. Available from: http://link.springer.com/10.1023/B:JADD.0000029547.96610.df

11. Bauminger N, Kasari C. Loneliness and friendship in high-functioning children with autism. Child Dev. 2000;71(2):447–56.

12. Chang Y-C, Chen C-H, Huang P-C, Lin L-Y. Understanding the characteristics of friendship quality, activity participation, and emotional well-being in Taiwanese adolescents with autism spectrum disorder. Scand J Occup Ther [Internet]. 2019 Sep 19 [cited 2020 Apr 30];26(6):452–62. Available from: https://www.tandfonline.com/doi/full/10.1080/11038128.2018.1449887

13. Lasgaard M, Nielsen A, Eriksen ME, Goossens L. Loneliness and social support in adolescent boys with autism spectrum disorders. J Autism Dev Disord [Internet]. 2010 Feb 15 [cited 2020 Oct 26];40(2):218–26. Available from: http://link.springer.com/10.1007/s10803-009-0851-z

14. Locke J, Ishijima EH, Kasari C, London N. Loneliness, friendship quality and the social networks of adolescents with high-functioning autism in an inclusive school setting. J Res Spec Educ Needs [Internet]. 2010 Jun [cited 2020 Oct 26];10(2):74–81. Available from: http://doi.wiley.com/10.1111/j.1471-3802.2010.01148.x

15. Dunn L, Diener M, Wright C, Wright S, Narumanchi A. Vocational exploration in an extracurricular technology program for youth with autism. Albin TJ, editor. Work [Internet]. 2015 Sep 30 [cited 2020 Jul 5];52(2):457–68. Available from: https://www.medra.org/servlet/aliasResolver?alias=iospress&doi=10.3233/WOR-152160

16. Diener ML, Wright CA, Dunn L, Wright SD, Anderson LL, Smith KN. A creative 3D design programme: Building on interests and social engagement for students with autism spectrum disorder (ASD). Int J Disabil Dev Educ [Internet]. 2016 Mar 3 [cited 2020 May 6];63(2):181–200. Available from: http://www.tandfonline.com/doi/full/10.1080/1034912X.2015.1053436

17. Ashburner JK, Bobir NI, van Dooren K. Evaluation of an innovative interest-based post-school transition programme for young people with autism spectrum disorder. Int J Disabil Dev Educ [Internet]. 2018 May 4 [cited 2020 May 6];65(3):262–85. Available from: https://www.tandfonline.com/doi/full/10.1080/1034912X.2017.1403012

18. Lee EAL, Black MH, Falkmer M, Tan T, Sheehy L, Bölte S, et al. “We can see a bright future”: Parents’ perceptions of the outcomes of participating in a strengths-based program for adolescents with autism spectrum disorder. J Autism Dev Disord [Internet]. 2020;50(9):3179–94. Available from: https://doi.org/10.1007/s10803-020-04411-9

19. Wainer J, Ferrari E, Dautenhahn K, Robins B. The effectiveness of using a robotics class to foster collaboration among groups of children with autism in an exploratory study. Pers Ubiquitous Comput [Internet]. 2010 Jul 12 [cited 2020 Jan 30];14(5):445–55. Available from: http://link.springer.com/10.1007/s00779-009-0266-z

20. Craig P, Dieppe P, Macintyre S, Michie S, Nazareth I, Petticrew M. Developing and evaluating complex interventions: the new Medical Research Council guidance. BMJ [Internet]. 2008 Sep 29 [cited 2020 Jul 30];a1655. Available from: https://www.bmj.com/lookup/doi/10.1136/bmj.a1655

21. Bianco M, Carothers DE, Smiley LR. Gifted Students With Asperger Syndrome. Interv Sch Clin [Internet]. 2009 Mar 1 [cited 2020 May 6];44(4):206–15. Available from: http://journals.sagepub.com/doi/10.1177/1053451208328827

22. Hamilton J, Stevens G, Girdler S. Becoming a mentor: The impact of training and the experience of mentoring university Students on the Autism Spectrum. Aleksic B, editor. PLoS One [Internet]. 2016 Apr 12 [cited 2021 Mar 24];11(4):e0153204. Available from: https://dx.plos.org/10.1371/journal.pone.0153204

23. Roberts N, Birmingham E. Mentoring university students with ASD: A mentee-centered approach. J Autism Dev Disord [Internet]. 2017 Apr 28 [cited 2021 Mar 24];47(4):1038–50. Available from: http://link.springer.com/10.1007/s10803-016-2997-9

24. Hammell KRW. Client-centred occupational therapy in Canada: Refocusing on core values. Can J Occup Ther [Internet]. 2013 Jun 24 [cited 2020 Mar 23];80(3):141–9. Available from: http://journals.sagepub.com/doi/10.1177/0008417413497906

25. Wright SD, D'Astous V, Wright CA, Diener ML. Grandparents of grandchildren with autism spectrum disorders (ASD): Strengthening relationships through technology activities. Int J Aging Hum Dev [Internet]. 2012 Sep 8 [cited 2020 Dec 24];75(2):169–84. Available from: http://journals.sagepub.com/doi/10.2190/AG.75.2.d

26. Diener ML, Anderson L, Wright CA, Dunn ML. Sibling relationships of children with autism spectrum disorder in the context of everyday life and a strength-based program. J Child Fam Stud [Internet]. 2015 Apr 6 [cited 2020 May 6];24(4):1060–72. Available from: http://link.springer.com/10.1007/s10826-014-9915-6

27. Chiang H-M, Cheung YK, Li H, Tsai LY. Factors associated with participation in employment for high school leavers with autism. J Autism Dev Disord [Internet]. 2013 Aug 9 [cited 2020 Dec 29];43(8):1832–42. Available from: http://link.springer.com/10.1007/s10803-012-1734-2

28. Wagner M, Newman L, Cameto R, Javitz H, Valdes K. A national picture of parent and youth participation in IEP and transition planning meetings. J Disabil Policy Stud [Internet]. 2012 [cited 2020 Jan 30];23(3):140–55. Available from: http://dps.sagepub.com/cgi/doi/10.1177/1044207311425384

29. Carter EW, Common EA, Sreckovic MA, Huber HB, Bottema-Beutel K, Gustafson JR, et al. Promoting social competence and peer relationships for adolescents with autism spectrum disorders. Remedial Spec Educ [Internet]. 2014 Mar 23 [cited 2020 Jul 5];35(2):91–101. Available from: http://journals.sagepub.com/doi/10.1177/0741932513514618

30. Daniel LS, Billingsley BS. What boys with an autism spectrum disorder say about establishing and maintaining friendships. Focus Autism Other Dev Disabl [Internet]. 2010 Dec 14 [cited 2020 May 16];25(4):220–9. Available from: http://journals.sagepub.com/doi/10.1177/1088357610378290

31. Wilson J, Mandich A, Magalhaes L, Gain K. Concept mapping and the CO-OP approach with adolescents with autism spectrum disorder: Exploring participant experiences. Open J Occup Ther [Internet]. 2018 Oct 1 [cited 2021 Mar 24];6(4). Available from: https://scholarworks.wmich.edu/ojot/vol6/iss4/3

32. Curtin C, Humphrey K, Vronsky K, Mattern K, Nicastro S, Perrin EC. Expanding horizons: A pilot mentoring program linking college/graduate students with teens with ASD. Clin Pediatr (Phila) [Internet]. 2016 Feb 27 [cited 2020 Nov 10];55(2):150–6. Available from: http://journals.sagepub.com/doi/10.1177/0009922815588821

33. Thompson C, Falkmer T, Evans K, Bölte S, Girdler S. A realist

evaluation of peer mentoring support for university students with autism. Br J Spec Educ [Internet]. 2018 Dec [cited 2021 Mar 24];45(4):412–34. Available from: http://doi.wiley.com/10.1111/1467-8578.12241

34. Asaro-Saddler K, Knox HM, Meredith H, Akhmedjanova D. Using technology to support students with autism spectrum disorders in the writing process: A pilot study. Insights Learn Disabil. 2015;12(2):103–19.

35. Gunn KCMM, Delafield-Butt JT. Teaching children with autism spectrum disorder with restricted interests. Rev Educ Res [Internet]. 2016 Jun [cited 2020 Dec 29];86(2):408–30. Available from: http://journals.sagepub.com/doi/10.3102/0034654315604027

36. Jung S, Sainato DM. Teaching games to young children with autism spectrum disorder using special interests and video modelling. J Intellect Dev Disabil [Internet]. 2015 Apr 3 [cited 2020 Dec 29];40(2):198–212. Available from: http://www.tandfonline.com/doi/full/10.3109/13668250.2015.1027674

37. Koegel LK, Singh AK, Koegel RL. Improving motivation for academics in children with autism. J Autism Dev Disord [Internet]. 2010 Sep 10 [cited 2020 May 16];40(9):1057–66. Available from: http://link.springer.com/10.1007/s10803-010-0962-6

38. Iovannone R, Dunlap G, Huber H, Kincaid D. Effective educational practices for students with autism spectrum disorders. Focus Autism Other Dev Disabl [Internet]. 2003 Aug 14 [cited 2020 May 16];18(3):150–65. Available from: http://journals.sagepub.com/doi/10.1177/10883576030180030301

39. Smith T. Individualizing the general education curriculum. In: Smith T, editor. Making inclusion work for students with autism spectrum disorders : An evidence-based guide. ProQuest Ebook Central: Guildford Publications; 2011. p. 167–97.

40. Ulke-Kurkcuoglu B, Kircaali-Iftar G. A comparison of the effects of providing activity and material choice to children with autism spectrum

disorders. J Appl Behav Anal [Internet]. 2010 Dec [cited 2020 May 20];43(4):717–21. Available from: http://doi.wiley.com/10.1901/jaba.2010.43-717

41. Carter CM. Using choice with game play to increase language skills and interactive behaviors in children with autism. J Posit Behav Interv. 2001;3(3):131–51.

42. Watanabe M, Sturmey P. The effect of choice-making opportunities during activity schedules on task engagement of adults with autism. J Autism Dev Disord [Internet]. 2003 [cited 2020 May 20];33(5):535–8. Available from: https://doi.org/10.1023/A:1025835729718

43. Müller E, Schuler A, Yates GB. Social challenges and supports from the perspective of individuals with Asperger syndrome and other autism spectrum disabilities. Autism [Internet]. 2008 Mar [cited 2020 May 16];12(2):173–90. Available from: http://journals.sagepub.com/doi/10.1177/1362361307086664

44. Hendricks D. Employment and adults with autism spectrum disorders: Challenges and strategies for success. J Vocat Rehabil [Internet]. 2010 [cited 2020 Jan 30];32(2):125–34. Available from: https://www.medra.org/servlet/aliasResolver?alias=iospress&doi=10.3233/JVR-2010-0502

45. Scott M, Falkmer M, Falkmer T, Girdler S. Evaluating the effectiveness of an autism-specific workplace tool for employers: A randomised controlled trial. J Autism Dev Disord [Internet]. 2018;48(10):3377–92. Available from: http://dx.doi.org/10.1007/s10803-018-3611-0

46. Kapp SK, Gillespie-Lynch K, Sherman LE, Hutman T. Deficit, difference, or both? Autism and neurodiversity. Dev Psychol [Internet]. 2013 [cited 2020 Dec 29];49(1):59–71. Available from: http://doi.apa.org/getdoi.cfm?doi=10.1037/a0028353

47. Seligman M. Flourish: a visionary new understanding of happiness and well-being. New York, NY: Free Press; 2011.

48. Adams N, Little TD, Ryan RM. Self-Determination Theory. In:

Development of Self-Determination Through the Life-Course [Internet]. Dordrecht: Springer Netherlands; 2017. p. 47–54. Available from: http://link.springer.com/10.1007/978-94-024-1042-6_4

49. World Health Organization. International classification of functioning, disability and health: Children and youth version: ICF-CY. Geneva: World Health Organization; 2007.

50. Patten Koenig K, Hough Williams L. Characterization and utilization of preferred interests: A survey of adults on the autism spectrum. Occup Ther Ment Heal [Internet]. 2017 Apr 3 [cited 2020 May 6];33(2):129–40. Available from: https://www.tandfonline.com/doi/full/10.1080/0164212X.2016.1248877

51. Tirrell JM, Dowling EM, Gansert P, Buckingham M, Wong CA, Suzuki S, et al. Toward a measure for assessing features of effective youth development programs: contextual safety and the “Big Three” components of positive youth development programs in Rwanda. Child Youth Care Forum [Internet]. 2019 [cited 2020 May 7];49(2). Available from: https://doi.org/10.1007/s10566-019-09524-6

52. Bowers EP, Li Y, Kiely MK, Brittian A, Lerner J V., Lerner RM. The Five Cs model of positive youth development: A longitudinal analysis of confirmatory factor structure and measurement invariance. J Youth Adolesc [Internet]. 2010 Jul 16 [cited 2020 Jul 11];39(7):720–35. Available from: http://link.springer.com/10.1007/s10964-010-9530-9

53. Niemiec CP, Ryan RM. Autonomy, competence, and relatedness in the classroom. Theory Res Educ [Internet]. 2009 Jul 25 [cited 2020 Oct 7];7(2):133–44. Available from: http://journals.sagepub.com/doi/10.1177/1477878509104318

54. Bölte S, Mahdi S, de Vries PJ, Granlund M, Robison JE, Shulman C, et al. The Gestalt of functioning in autism spectrum disorder: Results of the international conference to develop final consensus International Classification of Functioning, Disability and Health core sets. Autism [Internet]. 2019 Feb [cited 2020 Nov 14];23(2):449–67. Available from: http://journals.sagepub.com/doi/10.1177/1362361318755522

55. Reichow B, Steiner AM, Volkmar F. Social skills groups for people aged 6 to 21 with autism spectrum disorders (ASD). Cochrane Database Syst Rev [Internet]. 2012 Jul 11 [cited 2020 Aug 10];(7):1–38. Available from: http://doi.wiley.com/10.1002/14651858.CD008511.pub2

56. Mazurek MO. Loneliness, friendship, and well-being in adults with autism spectrum disorders. Autism [Internet]. 2014 Apr 3 [cited 2020 Oct 26];18(3):223–32. Available from: http://journals.sagepub.com/doi/10.1177/1362361312474121

57. Wright C, Diener ML, Dunn L, Wright SD, Linnell L, Newbold K, et al. SketchUp™: A technology tool to facilitate intergenerational family relationships for children with autism spectrum disorders (ASD). Fam Consum Sci Res J [Internet]. 2011 Dec [cited 2020 Aug 5];40(2):135–49. Available from: http://doi.wiley.com/10.1111/j.1552-3934.2011.02100.x

58. Capozzi S, Barmache D, Cladis E, Peña EV, Kocur J. The Significance of Involving Nonspeaking Autistic Peer Mentors in Educational Programs. Autism in Adulthood [Internet]. 2019 Sep 1 [cited 2021 Mar 17];1(3):170–2. Available from: https://www.liebertpub.com/doi/10.1089/aut.2019.0006

59. Hotez E, Shane-Simpson C, Obeid R, DeNigris D, Siller M, Costikas C, et al. Designing a summer transition program for incoming and current college students on the autism spectrum: A participatory approach. Front Psychol [Internet]. 2018 Feb 13 [cited 2021 Mar 19];9(FEB). Available from: http://journal.frontiersin.org/article/10.3389/fpsyg.2018.00046/full

60. Wright C, Diener M, Wright S, Rafferty D, Taylor C. Peer teachers with autism teaching 3D modeling. Int J Disabil Dev Educ [Internet]. 2018 [cited 2021 Mar 24];66(4):438–53. Available from: https://doi.org/10.1080/1034912X.2018.1540770

61. Nicolaidis C, Raymaker D, McDonald K, Dern S, Ashkenazy E, Boisclair C, et al. Collaboration strategies in nontraditional community-

based participatory research partnerships: Lessons from an academic–community partnership with autistic self-advocates. Prog Community Heal Partnerships Res Educ Action [Internet]. 2011 [cited 2021 Mar 19];5(2):143–50. Available from: http://muse.jhu.edu/content/crossref/journals/progress_in_community_health_partnerships_research_education_and_action/v005/5.2.nicolaidis.html

62. Lanou A, Hough L, Powell E. Case studies on using strengths and interests to address the needs of students with autism spectrum disorders. Interv Sch Clin [Internet]. 2012 Jan 10 [cited 2020 Aug 10];47(3):175–82. Available from: http://journals.sagepub.com/doi/10.1177/1053451211423819

63. Klin A, Danovitch JH, Merz AB, Volkmar FR. Circumscribed interests in higher functioning individuals with autism spectrum disorders: An exploratory study. Res Pract Pers with Sev Disabil [Internet]. 2007 Jun [cited 2020 Dec 30];32(2):89–100. Available from: http://journals.sagepub.com/doi/10.2511/rpsd.32.2.89

64. Scirra. Construct 2 (Version r279) [Internet]. London; 2019. Available from: https://www.scirra.com/construct2/releases/r279/download

65. Anthony LG, Kenworthy L, Yerys BE, Jankowski KF, James JD, Harms MB, et al. Interests in high-functioning autism are more intense, interfering, and idiosyncratic than those in neurotypical development. Dev Psychopathol [Internet]. 2013 Aug 23 [cited 2020 Dec 14];25(3):643–52. Available from: https://www.cambridge.org/core/product/identifier/S0954579413000072/type/journal_article

66. Mac Carthaigh S. Beyond biomedicine: challenging conventional conceptualisations of autism spectrum conditions. Disabil Soc [Internet]. 2020 Jan 2 [cited 2020 Dec 30];35(1):52–66. Available from: https://www.tandfonline.com/doi/full/10.1080/09687599.2019.1605884

67. Cosden M, Koegel LK, Koegel RL, Greenwell A, Klein E. Strength-based assessment for children with autism spectrum disorders. Res

Pract Pers with Sev Disabil [Internet]. 2006 Jun [cited 2020 Aug 11];31(2):134–43. Available from: http://journals.sagepub.com/doi/10.1177/154079690603100206

68. Ledford JR, Gast DL, Luscre D, Ayres KM. Observational and incidental learning by children with autism during small group instruction. J Autism Dev Disord [Internet]. 2008 Jan 9 [cited 2020 Jun 9];38(1):86–103. Available from: http://link.springer.com/10.1007/s10803-007-0363-7

69. Lindsay S, Proulx M, Scott H, Thomson N. Exploring teachers' strategies for including children with autism spectrum disorder in mainstream classrooms. Int J Incl Educ [Internet]. 2014 Feb [cited 2020 Jul 5];18(2):101–22. Available from: http://www.tandfonline.com/doi/abs/10.1080/13603116.2012.758320

70. Lee E, Black MH, Tan T, Falkmer T, Girdler S. "I'm destined to ace this": Work experience placement during high school for individuals with autism spectrum disorder. J Autism Dev Disord [Internet]. 2019 Aug 3 [cited 2020 Jan 8];49(8):3089–101. Available from: http://link.springer.com/10.1007/s10803-019-04024-x

71. Rispoli M, Lang R, Neely L, Camargo S, Hutchins N, Davenport K, et al. A comparison of within- and across-activity choices for reducing challenging behavior in children with autism spectrum disorders. J Behav Educ [Internet]. 2013 Mar 19 [cited 2020 May 20];22(1):66–83. Available from: http://link.springer.com/10.1007/s10864-012-9164-y

72. de Schipper E, Mahdi S, de Vries P, Granlund M, Holtmann M, Karande S, et al. Functioning and disability in autism spectrum disorder: A worldwide survey of experts. Autism Res [Internet]. 2016 Sep 8 [cited 2020 Aug 11];9(9):959–69. Available from: https://onlinelibrary.wiley.com/doi/10.1002/aur.1592

73. Pfeiffer B, Brusilovskiy E, Davidson A, Persch A. Impact of person-environment fit on job satisfaction for working adults with autism spectrum disorders. J Vocat Rehabil [Internet]. 2018 Feb 26 [cited 2020 Oct 16];48(1):49–57. Available from:

https://www.medra.org/servlet/aliasResolver?alias=iospress&doi=10.3233/JVR-170915

74. Pfeiffer B, Braun K, Kinnealey M, Derstine Matczak M, Polatajko H. Environmental factors impacting work satisfaction and performance for adults with autism spectrum disorders. J Vocat Rehabil [Internet]. 2017 Aug 21 [cited 2020 Oct 16];47(1):1–12. Available from: https://www.medra.org/servlet/aliasResolver?alias=iospress&doi=10.3233/JVR-170878

75. Kragt D, Holtrop D. Volunteering research in Australia: A narrative review. Aust J Psychol [Internet]. 2019 Dec 1 [cited 2020 Dec 13];71(4):342–60. Available from: https://www.tandfonline.com/doi/full/10.1111/ajpy.12251

76. Stukas AA, Daly M, Cowling MJ. Volunteerism and social capital: A functional approach. Aust J Volunt. 2005;10(2):35–44.

77. Ringuet-Riot C, Cuskelly G, Auld C, Zakus DH. Volunteer roles, involvement and commitment in voluntary sport organizations: evidence of core and peripheral volunteers [Internet]. Vol. 17, Sport in Society. Taylor & Francis; 2014. p. 116–33. Available from: http://dx.doi.org/10.1080/17430437.2013.828902

78. National Disability Insurance Agency. What is the NDIS? [Internet]. 2021 [cited 2021 Oct 27]. Available from: https://www.ndis.gov.au/understanding/what-ndis

79. Walsh ME, Backe S. School–university partnerships: Reflections and opportunities. Peabody J Educ [Internet]. 2013 Nov [cited 2020 Dec 14];88(5):594–607. Available from: http://www.tandfonline.com/doi/abs/10.1080/0161956X.2013.835158

80. Lee Y, Wehmeyer ML, Palmer SB, Williams-Diehm K, Davies DK, Stock SE. Examining individual and instruction-related predictors of the self-determination of students with disabilities: Multiple regression analyses. Remedial Spec Educ [Internet]. 2012 May 20 [cited 2021 Mar 24];33(4):150–61. Available from: http://journals.sagepub.com/doi/10.1177/0741932510392053

81. Shogren KA, Wehmeyer ML, Palmer SB, Rifenbark GG, Little TD. Relationships between self-determination and postschool outcomes for youth with disabilities. J Spec Educ [Internet]. 2015 [cited 2020 Dec 23];48(4):256–67. Available from: https://journals.sagepub.com/doi/10.1177/0022466913489733

82. Jones M, Falkmer M, Milbourn B, Tele T, Bölte S, Girdler S. A practical framework for delivering strength-based technology clubs for adolescents with autism spectrum disorder. Forthcoming. 2021;

83. Zwart FS, Vissers CTWM, Kessels RPC, Maes JHR. Implicit learning seems to come naturally for children with autism, but not for children with specific language impairment: Evidence from behavioral and ERP data. Autism Res. 2018;11(7):1050–61.

84. Lane CJ, Powell SL. Explicit-implicit instruction is a potentially effective approach for teaching grammatical forms to children with autism spectrum disorder. Evid Based Commun Assess Interv [Internet]. 2019;13(4):218–24. Available from: https://doi.org/10.1080/17489539.2019.1666494

85. Nemeth D, Janacsek K, Balogh V, Londe Z, Mingesz R, Fazekas M, et al. Learning in autism: Implicitly superb. PLoS One. 2010;5(7):1–7.

86. Foti F, De Crescenzo F, Vivanti G, Menghini D, Vicari S. Implicit learning in individuals with autism spectrum disorders: A meta-analysis. Psychol Med. 2015;45(5):897–910.

87. Liu J, Tsang T, Ponting C, Jackson L, Jeste SS, Bookheimer SY, et al. Lack of neural evidence for implicit language learning in 9-month-old infants at high risk for autism. Dev Sci. 2021;24(4):1–16.

88. Test DW, Mazzotti VL, Mustian AL, Fowler CH, Kortering L, Kohler P. Evidence-based secondary transition predictors for improving postschool outcomes for students with disabilities. Career Dev Transit Except Individ [Internet]. 2009 [cited 2020 Jul 5];32(3):160–81. Available from: http://cde.sagepub.com/cgi/doi/10.1177/0885728809346960

89. Hatfield M, Falkmer M, Falkmer T, Ciccarelli M. Effectiveness of the BOOST-A^{TM} online transition planning program for adolescents on the autism spectrum: a quasi-randomized controlled trial. Child Adolesc Psychiatry Ment Health [Internet]. 2017 Dec 10 [cited 2020 Jan 8];11(1):54. Available from: http://capmh.biomedcentral.com/articles/10.1186/s13034-017-0191-2

90. Hatfield M, Ciccarelli M, Falkmer T, Falkmer M. Factors related to successful transition planning for adolescents on the autism spectrum. J Res Spec Educ Needs [Internet]. 2018 Jan [cited 2020 Oct 16];18(1):3–14. Available from: http://doi.wiley.com/10.1111/1471-3802.12388

91. Rothman AJ, Haydon KC. Strategies to motivate behavior change: How can we mobilize adults to promote positive youth development? In: Mobilizing Adults for Positive Youth Development. Springer US; 2006. p. 101–14.

92. Hoye R, Cuskelly G, Taylor T, Darcy S. Volunteer motives and retention in community sport: A study of Australian rugby clubs. Aust J Volunt. 2008;13(2):40–8.

93. Alfes K, Antunes B, Shantz AD. The management of volunteers – what can human resources do? A review and research agenda. Int J Hum Resour Manag [Internet]. 2017 Jan 2 [cited 2020 Dec 13];28(1):62–97. Available from: https://www.tandfonline.com/doi/full/10.1080/09585192.2016.1242508

94. Milbourn B, Black MH, Buchanan A. Why people leave community service organizations: A mixed methods study. Volunt Int J Volunt Nonprofit Organ [Internet]. 2019 Feb 5 [cited 2020 Dec 14];30(1):272–81. Available from: http://link.springer.com/10.1007/s11266-018-0005-z

95. Campbell R, Pound P, Morgan M, Daker-White G, Britten N, Pill R, et al. Evaluating meta-ethnography: systematic analysis and synthesis of qualitative research. Health Technol Assess (Rockv) [Internet]. 2011 Dec [cited 2020 Jun 6];15(43):1–164. Available from: https://www.journalslibrary.nihr.ac.uk/hta/hta15430/

96. Atkins S, Lewin S, Smith H, Engel M, Fretheim A, Volmink J. Conducting a meta-ethnography of qualitative literature: Lessons learnt. BMC Med Res Methodol [Internet]. 2008 Dec 16 [cited 2020 Mar 17];8(1):21. Available from: https://bmcmedresmethodol.biomedcentral.com/articles/10.1186/1471-2288-8-21

97. Lee RP, Hart RI, Watson RM, Rapley T. Qualitative synthesis in practice: some pragmatics of meta-ethnography. Qual Res [Internet]. 2015 Jun 24 [cited 2020 Oct 14];15(3):334–50. Available from: http://journals.sagepub.com/doi/10.1177/1468794114524221

98. Goodson L, Vassar M. An overview of ethnography in healthcare and medical education research. J Educ Eval Health Prof [Internet]. 2011 Apr 25 [cited 2020 Dec 30];8:4. Available from: http://jeehp.org/DOIx.php?id=10.3352/jeehp.2011.8.4

99. Savage J. Ethnography and health care. BMJ. 2000;321:1400–2.

100. Lord C, Rutter M, DiLavore PC, Risi S, Gotham K, Bishop S. Autism diagnostic observation schedule, second edition (ADOS-2) manual. Torrance, CA: Western Psychological Services; 2012.

101. Shenton AK. Strategies for ensuring trustworthiness in qualitative research projects. Educ Inf. 2004;22:63–75.

102. Jones M, Falkmer M, Milbourn B, Tan T, Bölte S, Girdler S. The core elements of strength-based technology programs for autistic youth: A systematic review of qualitative evidence. Forthcoming. 2021;

103. Wanneroo Times. Coding “dojos” helping Perth students with autism develop new skills [Internet]. 2021 [cited 2021 Nov 2]. Available from: https://www.perthnow.com.au/community-news/wanneroo-times/coding-dojos-helping-perth-students-with-autism-develop-new-skills-c-2473207

104. Wei X, Yu JW, Shattuck P, McCracken M, Blackorby J. Science, technology, engineering, and mathematics (STEM) participation among college students with an autism spectrum disorder. J Autism Dev

Disord [Internet]. 2013 Jul 1 [cited 2020 Jan 20];43(7):1539–46. Available from: http://link.springer.com/10.1007/s10803-012-1700-z

105. Spek AA, Velderman E. Examining the relationship between autism spectrum disorders and technical professions in high functioning adults. Res Autism Spectr Disord [Internet]. 2013;7(5):606–12. Available from: http://dx.doi.org/10.1016/j.rasd.2013.02.002

106. Diener ML, Wright CA, Wright SD, Anderson LL. Tapping into technical talent: Using technology to facilitate personal, social and vocational skills in youth with autism spectrum disorder. In: Cardon TA, editor. Technology and the Treatment of Children with Autism Spectrum Disorder [Internet]. Cham, CH: Springer International Publishing; 2016. p. 160. Available from: https://www.springer.com/gp/book/9783319208718#aboutBook

107. Mottron L, Dawson M, Soulières I, Hubert B, Burack J. Enhanced perceptual functioning in autism: An update, and eight principles of autistic perception. J Autism Dev Disord [Internet]. 2006 Jan 2 [cited 2020 Sep 15];36(1):27–43. Available from: http://link.springer.com/10.1007/s10803-005-0040-7

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.

Adams, N., Little, T. D., & Ryan, R. M. (2017). Self-Determination Theory. In *Development of Self-Determination Through the Life-Course* (Vol. 55, pp. 47–54). Springer Netherlands. https://doi.org/10.1007/978-94-024-1042-6_4

Afsharnejad, B., Falkmer, M., Black, M. H., Alach, T., Lenhard, F., Fridell, A., Coco, C., Milne, K., Bölte, S., & Girdler, S. (2021). KONTAKT® social skills group training for Australian adolescents with autism spectrum disorder: a randomized controlled trial. *European Child and Adolescent Psychiatry*, *0123456789*. https://doi.org/10.1007/s00787-021-01814-6

Agran, M., Achola, E., Nixon, C. A., Wojcik, A., Cain, I., Thoma, C., Austin, K. M., & Tamura, R. B. (2017). Participation of students with intellectual and developmental disabilities in extracurricular activities: Does inclusion end at 3:00? *Education and Training in Autism and Developmental Disabilities*, *52*(1), 3–12.

Alfes, K., Antunes, B., & Shantz, A. D. (2017). The management of volunteers – what can human resources do? A review and research agenda. *The International Journal of Human Resource Management*, *28*(1), 62–97. https://doi.org/10.1080/09585192.2016.1242508

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders: DSM-5* (Fifth ed). American Psychiatric Publishing.

Anderson, K. A., Sosnowy, C., Kuo, A. A., & Shattuck, P. T. (2018). Transition of individuals with autism to adulthood: A review of qualitative studies. *Pediatrics*, *141*(s4), S318–S327. https://doi.org/10.1542/peds.2016-4300I

Anthony, L. G., Kenworthy, L., Yerys, B. E., Jankowski, K. F., James, J. D.,

Harms, M. B., Martin, A., & Wallace, G. L. (2013). Interests in high-functioning autism are more intense, interfering, and idiosyncratic than those in neurotypical development. *Development and Psychopathology*, *25*(3), 643–652. https://doi.org/10.1017/S0954579413000072

Asaro-Saddler, K., Knox, H. M., Meredith, H., & Akhmedjanova, D. (2015). Using technology to support students with autism spectrum disorders in the writing process: A pilot study. *Insights on Learning Disabilities*, *12*(2), 103–119.

Ashburner, J. K., Bobir, N. I., & van Dooren, K. (2018). Evaluation of an innovative interest-based post-school transition programme for young people with autism spectrum disorder. *International Journal of Disability, Development and Education*, *65*(3), 262–285. https://doi.org/10.1080/1034912X.2017.1403012

Atkins, S., Lewin, S., Smith, H., Engel, M., Fretheim, A., & Volmink, J. (2008). Conducting a meta-ethnography of qualitative literature: Lessons learnt. *BMC Medical Research Methodology*, *8*(1), 21. https://doi.org/10.1186/1471-2288-8-21

Australian Bureau of Statistics. (2019). *Disability, ageing and carers, Australia: Summary of findings*. https://www.abs.gov.au/statistics/health/disability/disability-ageing-and-carers-australia-summary-findings/2018#autism-in-australia

Barber, B. L., Stone, M. R., Hunt, J. E., & Eccles, J. S. (2005). Benefits of activity participation: The roles of identity affirmation and peer group norm sharing. In *Organized Activities As Contexts of Development: Extracurricular Activities, After School and Community Programs* (pp. 185–210). Taylor & Francis Group.

Baron-Cohen, S. (2009). Autism: The Empathizing-Systemizing (E-S) Theory. *Annals of the New York Academy of Sciences*, *1156*(1), 68–80. https://doi.org/10.1111/j.1749-6632.2009.04467.x

Baron-Cohen, S., Ashwin, E., Ashwin, C., Tavassoli, T., & Chakrabarti, B. (2009). Talent in autism: hyper-systemizing, hyper-attention to detail and sensory hypersensitivity. *Philosophical Transactions of the Royal Society*

B: Biological Sciences, *364*(1522), 1377–1383. https://doi.org/10.1098/rstb.2008.0337

Baron-Cohen, S., Wheelwright, S., Burtenshaw, A., & Hobson, E. (2007). Mathematical talent is linked to autism. *Human Nature*, *18*(2), 125–131. https://doi.org/10.1007/s12110-007-9014-0

Bauminger, N., & Kasari, C. (2000). Loneliness and friendship in high-functioning children with autism. *Child Development*, *71*(2), 447–456.

Beaumont, R., & Sofronoff, K. (2008). A multi-component social skills intervention for children with Asperger syndrome: The Junior Detective Training Program. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *49*(7), 743–753. https://doi.org/10.1111/j.1469-7610.2008.01920.x

Bianco, M., Carothers, D. E., & Smiley, L. R. (2009). Gifted Students With Asperger Syndrome. *Intervention in School and Clinic*, *44*(4), 206–215. https://doi.org/10.1177/1053451208328827

Black, M. H., Mahdi, S., Milbourn, B., Scott, M., Gerber, A., Esposito, C., Falkmer, M., Lerner, M. D., Halladay, A., Ström, E., D'Angelo, A., Falkmer, T., Bölte, S., & Girdler, S. (2020). Multi-informant international perspectives on the facilitators and barriers to employment for autistic adults. *Autism Research*, *13*(7), 1195–1214. https://doi.org/10.1002/aur.2288

Bohnert, A., Aikins, J. W., & Arola, N. T. (2013). Regrouping: Organized activity involvement and social adjustment across the transition to high school. In J. A. Fredricks & S. D. Simpkins (Eds.), *Organized Out-of-School Activities: Settings for Peer Relationships. New Directions for Child and Adolescent Development* (Vol. 140, pp. 57–75).

Bölte, S., Mahdi, S., de Vries, P. J., Granlund, M., Robison, J. E., Shulman, C., Swedo, S., Tonge, B., Wong, V., Zwaigenbaum, L., Segerer, W., & Selb, M. (2019). The Gestalt of functioning in autism spectrum disorder: Results of the international conference to develop final consensus International Classification of Functioning, Disability and Health core sets. *Autism*, *23*(2), 449–467.

https://doi.org/10.1177/1362361318755522

Bottema-Beutel, K., Park, H., & Kim, S. Y. (2018). Commentary on social skills training curricula for individuals with ASD: Social interaction, authenticity, and stigma. *Journal of Autism and Developmental Disorders*, *48*(3), 953–964. https://doi.org/10.1007/s10803-017-3400-1

Bowen, D. J., Kreuter, M., Spring, B., Cofta-Woerpel, L., Linnan, L., Weiner, D., Bakken, S., Kaplan, C. P., Squiers, L., Fabrizio, C., & Fernandez, M. (2009). How we design feasibility studies. *American Journal of Preventive Medicine*, *36*(5), 452–457. https://doi.org/10.1016/j.amepre.2009.02.002

Bowers, E. P., Li, Y., Kiely, M. K., Brittian, A., Lerner, J. V., & Lerner, R. M. (2010). The Five Cs model of positive youth development: A longitudinal analysis of confirmatory factor structure and measurement invariance. *Journal of Youth and Adolescence*, *39*(7), 720–735. https://doi.org/10.1007/s10964-010-9530-9

Burke, M., Kraut, R., & Williams, D. (2010). Social use of computer-mediated communication by adults on the autism spectrum. *Proceedings of the 2010 ACM Conference on Computer Supported Cooperative Work - CSCW '10*, 425. https://doi.org/10.1145/1718918.1718991

Campbell, M., Fitzpatrick, R., Haines, A., Kinmouth, A., Sandercock, P., Spiegelhalter, D., & Tyrer, P. (2000). Framework for design and evaluation of complex interventions to improve health. *BMJ*, *321*, 694–696. https://doi.org/10.1136/bmj.321.7262.694

Campbell, N., Murray, E., Darbyshire, J., Emery, J., Farmer, A., Griffiths, F., Guthrie, B., Lester, H., Wilson, P., & Kinmonth, A. L. (2007). Designing and evaluating complex interventions to improve health care. *BMJ (Clinical Research Ed.)*, *334*(7591), 455–459. https://doi.org/10.1136/bmj.39108.379965.BE

Campbell, R., Pound, P., Morgan, M., Daker-White, G., Britten, N., Pill, R., Yardley, L., Pope, C., & Donovan, J. (2011). Evaluating meta-ethnography: systematic analysis and synthesis of qualitative research. *Health Technology Assessment*, *15*(43), 1–164.

https://doi.org/10.3310/hta15430

Capozzi, S., Barmache, D., Cladis, E., Peña, E. V., & Kocur, J. (2019). The Significance of Involving Nonspeaking Autistic Peer Mentors in Educational Programs. *Autism in Adulthood*, *1*(3), 170–172. https://doi.org/10.1089/aut.2019.0006

Caron, M. (2004). Do high functioning persons with autism present superior spatial abilities? *Neuropsychologia*, *42*(4), 467–481. https://doi.org/10.1016/j.neuropsychologia.2003.08.015

Carruthers, S., Pickles, A., Slonims, V., Howlin, P., & Charman, T. (2020). Beyond intervention into daily life: A systematic review of generalisation following social communication interventions for young children with autism. *Autism Research*, *13*(4), 506–522. https://doi.org/10.1002/aur.2264

Carter, C. M. (2001). Using choice with game play to increase language skills and interactive behaviors in children with autism. *Journal of Positive Behavior Interventions*, *3*(3), 131–151.

Carter, E. W., Common, E. A., Sreckovic, M. A., Huber, H. B., Bottema-Beutel, K., Gustafson, J. R., Dykstra, J., & Hume, K. (2014). Promoting social competence and peer relationships for adolescents with autism spectrum disorders. *Remedial and Special Education*, *35*(2), 91–101. https://doi.org/10.1177/0741932513514618

Carter, E. W., Swedeen, B., Moss, C. K., & Pesko, M. J. (2010). “What are you doing after school?” *Intervention in School and Clinic*, *45*(5), 275–283. https://doi.org/10.1177/1053451209359077

Chang, Y.-C., Chen, C.-H., Huang, P.-C., & Lin, L.-Y. (2019). Understanding the characteristics of friendship quality, activity participation, and emotional well-being in Taiwanese adolescents with autism spectrum disorder. *Scandinavian Journal of Occupational Therapy*, *26*(6), 452–462. https://doi.org/10.1080/11038128.2018.1449887

Chiang, H.-M., Cheung, Y. K., Li, H., & Tsai, L. Y. (2013). Factors associated with participation in employment for high school leavers with autism.

Journal of Autism and Developmental Disorders, *43*(8), 1832–1842. https://doi.org/10.1007/s10803-012-1734-2

Cimera, R. E., & Cowan, R. J. (2009). The costs of services and employment outcomes achieved by adults with autism in the US. *Autism*, *13*(3), 285–302. https://doi.org/10.1177/1362361309103791

Cosden, M., Koegel, L. K., Koegel, R. L., Greenwell, A., & Klein, E. (2006). Strength-based assessment for children with autism spectrum disorders. *Research and Practice for Persons with Severe Disabilities*, *31*(2), 134–143. https://doi.org/10.1177/154079690603100206

Craig, P., Dieppe, P., Macintyre, S., Michie, S., Nazareth, I., & Petticrew, M. (2008). Developing and evaluating complex interventions: the new Medical Research Council guidance. *BMJ*, a1655. https://doi.org/10.1136/bmj.a1655

Curtin, C., Humphrey, K., Vronsky, K., Mattern, K., Nicastro, S., & Perrin, E. C. (2016). Expanding horizons: A pilot mentoring program linking college/graduate students with teens with ASD. *Clinical Pediatrics*, *55*(2), 150–156. https://doi.org/10.1177/0009922815588821

Daniel, L. S., & Billingsley, B. S. (2010). What boys with an autism spectrum disorder say about establishing and maintaining friendships. *Focus on Autism and Other Developmental Disabilities*, *25*(4), 220–229. https://doi.org/10.1177/1088357610378290

Dawes, N. P., & Larson, R. (2011). How youth get engaged: Grounded-theory research on motivational development in organized youth programs. *Developmental Psychology*, *47*(1), 259–269. https://doi.org/10.1037/a0020729

de Schipper, E., Mahdi, S., de Vries, P., Granlund, M., Holtmann, M., Karande, S., Almodayfer, O., Shulman, C., Tonge, B., Wong, V. V. C. N., Zwaigenbaum, L., & Bölte, S. (2016). Functioning and disability in autism spectrum disorder: A worldwide survey of experts. *Autism Research*, *9*(9), 959–969. https://doi.org/10.1002/aur.1592

Diener, M. L., Anderson, L., Wright, C. A., & Dunn, M. L. (2015). Sibling

relationships of children with autism spectrum disorder in the context of everyday life and a strength-based program. *Journal of Child and Family Studies*, *24*(4), 1060–1072. https://doi.org/10.1007/s10826-014-9915-6

Diener, M. L., Wright, C. A., Dunn, L., Wright, S. D., Anderson, L. L., & Smith, K. N. (2016). A creative 3D design programme: Building on interests and social engagement for students with autism spectrum disorder (ASD). *International Journal of Disability, Development and Education*, *63*(2), 181–200. https://doi.org/10.1080/1034912X.2015.1053436

Diener, M. L., Wright, C. A., Wright, S. D., & Anderson, L. L. (2016). Tapping into technical talent: Using technology to facilitate personal, social and vocational skills in youth with autism spectrum disorder. In T. A. Cardon (Ed.), *Technology and the Treatment of Children with Autism Spectrum Disorder* (p. 160). Springer International Publishing. https://doi.org/10.1007/978-3-319-20872-5

Dunn, L., Diener, M., Wright, C., Wright, S., & Narumanchi, A. (2015). Vocational exploration in an extracurricular technology program for youth with autism. *Work*, *52*(2), 457–468. https://doi.org/10.3233/WOR-152160

Durlak, J. A., Weissberg, R. P., & Pachan, M. (2010). A meta-analysis of after-school programs that seek to promote personal and social skills in children and adolescents. *American Journal of Community Psychology*, *45*(3–4), 294–309. https://doi.org/10.1007/s10464-010-9300-6

Eccles, J. S., Barber, B. L., Stone, M., & Hunt, J. (2003). Extracurricular Activities and Adolescent Development. *Journal of Social Issues*, *59*(4), 865–889. https://doi.org/10.1046/j.0022-4537.2003.00095.x

Flores, M. M., Hill, D. A., Faciane, L. B., Edwards, M. A., Tapley, S. C., & Dowling, S. J. (2014). The Apple iPad as assistive technology for story-based interventions. *Journal of Special Education Technology*, *29*(2), 27–37. https://doi.org/10.1177/016264341402900203

Foti, F., De Crescenzo, F., Vivanti, G., Menghini, D., & Vicari, S. (2015). Implicit learning in individuals with autism spectrum disorders: A meta-analysis. *Psychological Medicine*, *45*(5), 897–910. https://doi.org/10.1017/S0033291714001950

Fredricks, J. A., & Eccles, J. S. (2005). Developmental benefits of extracurricular involvement: Do peer characteristics mediate the link between activities and youth outcomes? *Journal of Youth and Adolescence*, *34*(6), 507–520. https://doi.org/10.1007/s10964-005-8933-5

French, L., & Kennedy, E. M. M. (2018). Annual research review: Early intervention for infants and young children with, or at-risk of, autism spectrum disorder: a systematic review. *Journal of Child Psychology and Psychiatry*, *59*(4), 444–456. https://doi.org/10.1111/jcpp.12828

Furfaro, H. (n.d.). *The extreme male brain, explained*. Retrieved October 28, 2021, from https://www.spectrumnews.org/news/extreme-male-brain-explained/

Gillespie-Lynch, K., Kapp, S. K., Shane-Simpson, C., Smith, D. S., & Hutman, T. (2014). Intersections between the autism spectrum and the internet: Perceived benefits and preferred functions of computer-mediated communication. *Intellectual and Developmental Disabilities*, *52*(6), 456–469. https://doi.org/10.1352/1934-9556-52.6.456

Goodson, L., & Vassar, M. (2011). An overview of ethnography in healthcare and medical education research. *Journal of Educational Evaluation for Health Professions*, *8*, 4. https://doi.org/10.3352/jeehp.2011.8.4

Gunn, K. C. M. M., & Delafield-Butt, J. T. (2016). Teaching children with autism spectrum disorder with restricted interests. *Review of Educational Research*, *86*(2), 408–430. https://doi.org/10.3102/0034654315604027

Hagner, D., Kurtz, A., Cloutier, H., Arakelian, C., Brucker, D. L., & May, J. (2012). Outcomes of a family-centered transition process for students with autism spectrum disorders. *Focus on Autism and Other Developmental Disabilities*, *27*(1), 42–50. https://doi.org/10.1177/1088357611430841

Hamilton, J., Stevens, G., & Girdler, S. (2016). Becoming a mentor: The impact of training and the experience of mentoring university Students on the Autism Spectrum. *PLOS ONE*, *11*(4), e0153204. https://doi.org/10.1371/journal.pone.0153204

Hammell, K. R. W. (2013). Client-centred occupational therapy in Canada: Refocusing on core values. *Canadian Journal of Occupational Therapy*, *80*(3), 141–149. https://doi.org/10.1177/0008417413497906

Happé, F., & Frith, U. (2006). The weak coherence account: Detail-focused cognitive style in autism spectrum disorders. *Journal of Autism and Developmental Disorders*, *36*(1), 5–25. https://doi.org/10.1007/s10803-005-0039-0

Hatfield, M., Ciccarelli, M., Falkmer, T., & Falkmer, M. (2018). Factors related to successful transition planning for adolescents on the autism spectrum. *Journal of Research in Special Educational Needs*, *18*(1), 3–14. https://doi.org/10.1111/1471-3802.12388

Hatfield, M., Falkmer, M., Falkmer, T., & Ciccarelli, M. (2017). Effectiveness of the BOOST-A™ online transition planning program for adolescents on the autism spectrum: a quasi-randomized controlled trial. *Child and Adolescent Psychiatry and Mental Health*, *11*(1), 54. https://doi.org/10.1186/s13034-017-0191-2

Hatfield, M., Falkmer, M., Falkmer, T., & Ciccarelli, M. (2018). Process Evaluation of the BOOST-A™ Transition Planning Program for Adolescents on the Autism Spectrum: A Strengths-Based Approach. *Journal of Autism and Developmental Disorders*, *48*(2), 377–388. https://doi.org/10.1007/s10803-017-3317-8

Hatfield, M., Murray, N., Ciccarelli, M., Falkmer, T., & Falkmer, M. (2017). Pilot of the BOOST-A™: An online transition planning program for adolescents with autism. *Australian Occupational Therapy Journal*, *64*(6), 448–456. https://doi.org/10.1111/1440-1630.12410

Hendricks, D. (2010). Employment and adults with autism spectrum disorders: Challenges and strategies for success. *Journal of Vocational Rehabilitation*, *32*(2), 125–134. https://doi.org/10.3233/JVR-2010-0502

Hendricks, D. R., & Wehman, P. (2009). Transition From School to Adulthood for Youth With Autism Spectrum Disorders. *Focus on Autism and Other Developmental Disabilities*, *24*(2), 77–88. https://doi.org/10.1177/1088357608329827

Hotez, E., Shane-Simpson, C., Obeid, R., DeNigris, D., Siller, M., Costikas, C., Pickens, J., Massa, A., Giannola, M., D'Onofrio, J., & Gillespie-Lynch, K. (2018). Designing a summer transition program for incoming and current college students on the autism spectrum: A participatory approach. *Frontiers in Psychology*, *9*(FEB). https://doi.org/10.3389/fpsyg.2018.00046

Howlin, P., Goode, S., Hutton, J., & Rutter, M. (2004). Adult outcome for children with autism. *Journal of Child Psychology and Psychiatry*, *45*(2), 212–229. https://doi.org/10.1111/j.1469-7610.2004.00215.x

Hoye, R., Cuskelly, G., Taylor, T., & Darcy, S. (2008). Volunteer motives and retention in community sport: A study of Australian rugby clubs. *Australian Journal on Volunteering*, *13*(2), 40–48.

Hull, L., Goulding, L., Khadjesari, Z., Davis, R., Healey, A., Bakolis, I., & Sevdalis, N. (2019). Designing high-quality implementation research: development, application, feasibility and preliminary evaluation of the implementation science research development (ImpRes) tool and guide. *Implementation Science*, *14*(1), 80. https://doi.org/10.1186/s13012-019-0897-z

Individuals with Disabilities Education Act, 20 U.S.C. § 1401, (2004). https://sites.ed.gov/idea/statute-chapter-33/subchapter-i/1401

Iovannone, R., Dunlap, G., Huber, H., & Kincaid, D. (2003). Effective educational practices for students with autism spectrum disorders. *Focus on Autism and Other Developmental Disabilities*, *18*(3), 150–165. https://doi.org/10.1177/10883576030180030301

Jones, M., Falkmer, M., Milbourn, B., Tan, T., Bölte, S., & Girdler, S. (2021). The core elements of strength-based technology programs for autistic youth: A systematic review of qualitative evidence. *Forthcoming*.

Jones, M., Falkmer, M., Milbourn, B., Tele, T., Bölte, S., & Girdler, S. (2021). A practical framework for delivering strength-based technology clubs for adolescents with autism spectrum disorder. *Forthcoming*.

Jonsson, U., Choque Olsson, N., & Bölte, S. (2016). Can findings from

randomized controlled trials of social skills training in autism spectrum disorder be generalized? The neglected dimension of external validity. *Autism*, *20*(3), 295–305. https://doi.org/10.1177/1362361315583817

Jonsson, U., Coco, C., Fridell, A., Brown, S., Berggren, S., Hirvikoski, T., & Bölte, S. (2021). Proof of concept: The TRANSITION program for young adults with autism spectrum disorder and/or attention deficit hyperactivity disorder. *Scandinavian Journal of Occupational Therapy*, *28*(2), 78–90. https://doi.org/10.1080/11038128.2019.1695933

Jung, S., & Sainato, D. M. (2015). Teaching games to young children with autism spectrum disorder using special interests and video modelling. *Journal of Intellectual and Developmental Disability*, *40*(2), 198–212. https://doi.org/10.3109/13668250.2015.1027674

Kaldy, Z., Giserman, I., Carter, A. S., & Blaser, E. (2016). The mechanisms underlying the ASD advantage in visual search. *Journal of Autism and Developmental Disorders*, *46*(5), 1513–1527. https://doi.org/10.1007/s10803-013-1957-x

Kapp, S. K., Gillespie-Lynch, K., Sherman, L. E., & Hutman, T. (2013). Deficit, difference, or both? Autism and neurodiversity. *Developmental Psychology*, *49*(1), 59–71. https://doi.org/10.1037/a0028353

Kenny, L., Hattersley, C., Molins, B., Buckley, C., Povey, C., & Pellicano, E. (2016). Which terms should be used to describe autism? Perspectives from the UK autism community. *Autism*, *20*(4), 442–462. https://doi.org/10.1177/1362361315588200

King, D. L., Delfabbro, P. H., & Zajac, I. T. (2011). Preliminary validation of a new clinical tool for identifying problem video game playing. *International Journal of Mental Health and Addiction*, *9*, 72–87. https://doi.org/10.1007/s11469-009-9254-9

Klin, A., Danovitch, J. H., Merz, A. B., & Volkmar, F. R. (2007). Circumscribed interests in higher functioning individuals with autism spectrum disorders: An exploratory study. *Research and Practice for Persons with Severe Disabilities*, *32*(2), 89–100. https://doi.org/10.2511/rpsd.32.2.89

Koegel, L. K., Singh, A. K., & Koegel, R. L. (2010). Improving motivation for academics in children with autism. *Journal of Autism and Developmental Disorders*, *40*(9), 1057–1066. https://doi.org/10.1007/s10803-010-0962-6

Kragt, D., & Holtrop, D. (2019). Volunteering research in Australia: A narrative review. *Australian Journal of Psychology*, *71*(4), 342–360. https://doi.org/10.1111/ajpy.12251

Lane, C. J., & Powell, S. L. (2019). Explicit-implicit instruction is a potentially effective approach for teaching grammatical forms to children with autism spectrum disorder. *Evidence-Based Communication Assessment and Intervention*, *13*(4), 218–224. https://doi.org/10.1080/17489539.2019.1666494

Lanou, A., Hough, L., & Powell, E. (2012). Case studies on using strengths and interests to address the needs of students with autism spectrum disorders. *Intervention in School and Clinic*, *47*(3), 175–182. https://doi.org/10.1177/1053451211423819

Lasgaard, M., Nielsen, A., Eriksen, M. E., & Goossens, L. (2010). Loneliness and social support in adolescent boys with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, *40*(2), 218–226. https://doi.org/10.1007/s10803-009-0851-z

Ledford, J. R., Gast, D. L., Luscre, D., & Ayres, K. M. (2008). Observational and incidental learning by children with autism during small group instruction. *Journal of Autism and Developmental Disorders*, *38*(1), 86–103. https://doi.org/10.1007/s10803-007-0363-7

Lee, E. A. L., Black, M. H., Falkmer, M., Tan, T., Sheehy, L., Bölte, S., & Girdler, S. (2020). “We can see a bright future”: Parents’ perceptions of the outcomes of participating in a strengths-based program for adolescents with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, *50*(9), 3179–3194. https://doi.org/10.1007/s10803-020-04411-9

Lee, E., Black, M. H., Tan, T., Falkmer, T., & Girdler, S. (2019). “I’m destined to ace this”: Work experience placement during high school for individuals with autism spectrum disorder. *Journal of Autism and*

Developmental Disorders, *49*(8), 3089–3101. https://doi.org/10.1007/s10803-019-04024-x

Lee, G., & Carter, E. W. (2012). Preparing transition-age students with high-functioning autism spectrum disorders for meaningful work. *Psychology in the Schools*, *49*(10), 988–1000. https://doi.org/10.1002/pits.21651

Lee, R. P., Hart, R. I., Watson, R. M., & Rapley, T. (2015). Qualitative synthesis in practice: some pragmatics of meta-ethnography. *Qualitative Research*, *15*(3), 334–350. https://doi.org/10.1177/1468794114524221

Lee, Y., Wehmeyer, M. L., Palmer, S. B., Williams-Diehm, K., Davies, D. K., & Stock, S. E. (2012). Examining individual and instruction-related predictors of the self-determination of students with disabilities: Multiple regression analyses. *Remedial and Special Education*, *33*(4), 150–161. https://doi.org/10.1177/0741932510392053

Levac, D., Rivard, L., & Missiuna, C. (2012). Defining the active ingredients of interactive computer play interventions for children with neuromotor impairments: A scoping review. *Research in Developmental Disabilities*, *33*(1), 214–223. https://doi.org/10.1016/j.ridd.2011.09.007

Lindsay, S., Proulx, M., Scott, H., & Thomson, N. (2014). Exploring teachers' strategies for including children with autism spectrum disorder in mainstream classrooms. *International Journal of Inclusive Education*, *18*(2), 101–122. https://doi.org/10.1080/13603116.2012.758320

Liptak, G. S., Kennedy, J. A., & Dosa, N. P. (2011). Social participation in a nationally representative sample of older youth and young adults with autism. *Journal of Developmental and Behavioral Pediatrics*, *32*(4), 277–283. https://doi.org/10.1097/DBP.0b013e31820b49fc

Liu, J., Tsang, T., Ponting, C., Jackson, L., Jeste, S. S., Bookheimer, S. Y., & Dapretto, M. (2021). Lack of neural evidence for implicit language learning in 9-month-old infants at high risk for autism. *Developmental Science*, *24*(4), 1–16. https://doi.org/10.1111/desc.13078

Locke, J., Ishijima, E. H., Kasari, C., & London, N. (2010). Loneliness, friendship quality and the social networks of adolescents with high-

functioning autism in an inclusive school setting. *Journal of Research in Special Educational Needs*, *10*(2), 74–81. https://doi.org/10.1111/j.1471-3802.2010.01148.x

Lord, C., Rutter, M., DiLavore, P. C., Risi, S., Gotham, K., & Bishop, S. (2012). *Autism diagnostic observation schedule, second edition (ADOS-2) manual*. Western Psychological Services.

Lorenz, T., & Heinitz, K. (2014). Aspergers – Different, not less: Occupational strengths and job interests of individuals with Asperger's syndrome. *PLoS ONE*, *9*(6), e100358. https://doi.org/10.1371/journal.pone.0100358

Mac Carthaigh, S. (2020). Beyond biomedicine: challenging conventional conceptualisations of autism spectrum conditions. *Disability & Society*, *35*(1), 52–66. https://doi.org/10.1080/09687599.2019.1605884

Mahoney, J. L., Cairns, B. D., & Farmer, T. W. (2003). Promoting interpersonal competence and educational success through extracurricular activity participation. *Journal of Educational Psychology*, *95*(2), 409–418. https://doi.org/10.1037/0022-0663.95.2.409

Mazurek, M. O. (2014). Loneliness, friendship, and well-being in adults with autism spectrum disorders. *Autism*, *18*(3), 223–232. https://doi.org/10.1177/1362361312474121

McDonald, T. A., & Machalicek, W. (2013). Systematic review of intervention research with adolescents with autism spectrum disorders. *Research in Autism Spectrum Disorders*, *7*(11), 1439–1460. https://doi.org/10.1016/j.rasd.2013.07.015

McGuire, J., & McDonnell, J. (2008). Relationships between recreation and levels of self-determination for adolescents and young adults with disabilities. *Career Development for Exceptional Individuals*, *31*(3), 154–163. https://doi.org/10.1177/0885728808315333

Milbourn, B., Black, M. H., & Buchanan, A. (2019). Why people leave community service organizations: A mixed methods study. *VOLUNTAS: International Journal of Voluntary and Nonprofit Organizations*, *30*(1), 272–281. https://doi.org/10.1007/s11266-018-0005-z

Moore, M., & Calvert, S. (2000). Brief report: Vocabulary acquisition for children with autism. Teacher or computer instruction. *Journal of Autism and Developmental Disorders*, *30*(4), 359–362.

Mottron, L., Dawson, M., Soulières, I., Hubert, B., & Burack, J. (2006). Enhanced perceptual functioning in autism: An update, and eight principles of autistic perception. *Journal of Autism and Developmental Disorders*, *36*(1), 27–43. https://doi.org/10.1007/s10803-005-0040-7

Müller, E., Schuler, A., & Yates, G. B. (2008). Social challenges and supports from the perspective of individuals with Asperger syndrome and other autism spectrum disabilities. *Autism*, *12*(2), 173–190. https://doi.org/10.1177/1362361307086664

Myers, E., Davis, B. E., Stobbe, G., & Bjornson, K. (2015). Community and social participation among individuals with autism spectrum disorder transitioning to adulthood. *Journal of Autism and Developmental Disorders*, *45*(8), 2373–2381. https://doi.org/10.1007/s10803-015-2403-z

National Disability Insurance Agency. (2021). *What is the NDIS?* https://www.ndis.gov.au/understanding/what-ndis

Nemeth, D., Janacsek, K., Balogh, V., Londe, Z., Mingesz, R., Fazekas, M., Jambori, S., Danyi, I., & Vetro, A. (2010). Learning in autism: Implicitly superb. *PLoS ONE*, *5*(7), 1–7. https://doi.org/10.1371/journal.pone.0011731

Nicolaidis, C., Raymaker, D., McDonald, K., Dern, S., Ashkenazy, E., Boisclair, C., Robertson, S., & Baggs, A. (2011). Collaboration strategies in nontraditional community-based participatory research partnerships: Lessons from an academic–community partnership with autistic self-advocates. *Progress in Community Health Partnerships: Research, Education, and Action*, *5*(2), 143–150. https://doi.org/10.1353/cpr.2011.0022

Niemiec, C. P., & Ryan, R. M. (2009). Autonomy, competence, and relatedness in the classroom. *Theory and Research in Education*, *7*(2), 133–144. https://doi.org/10.1177/1477878509104318

Orsmond, G. I., Krauss, M. W., & Seltzer, M. M. (2004). Peer relationships and social and recreational activities among adolescents and adults with autism. *Journal of Autism and Developmental Disorders*, *34*(3), 245–256. https://doi.org/10.1023/B:JADD.0000029547.96610.df

Orsmond, G. I., Shattuck, P. T., Cooper, B. P., Sterzing, P. R., & Anderson, K. A. (2013). Social participation among young adults with an autism spectrum disorder. *Journal of Autism and Developmental Disorders*, *43*(11), 2710–2719. https://doi.org/10.1007/s10803-013-1833-8

Patten Koenig, K., & Hough Williams, L. (2017). Characterization and utilization of preferred interests: A survey of adults on the autism spectrum. *Occupational Therapy in Mental Health*, *33*(2), 129–140. https://doi.org/10.1080/0164212X.2016.1248877

Peters, D. H., Tran, N. T., & Adam, T. (2013). *Implementation research in health: A practical guide*. World Health Organization. https://doi.org/ISBN 978 92 4 150621 2

Pfeiffer, B., Braun, K., Kinnealey, M., Derstine Matczak, M., & Polatajko, H. (2017). Environmental factors impacting work satisfaction and performance for adults with autism spectrum disorders. *Journal of Vocational Rehabilitation*, *47*(1), 1–12. https://doi.org/10.3233/JVR-170878

Pfeiffer, B., Brusilovskiy, E., Davidson, A., & Persch, A. (2018). Impact of person-environment fit on job satisfaction for working adults with autism spectrum disorders. *Journal of Vocational Rehabilitation*, *48*(1), 49–57. https://doi.org/10.3233/JVR-170915

Proctor, E., Silmere, H., Raghavan, R., Hovmand, P., Aarons, G., Bunger, A., Griffey, R., & Hensley, M. (2011). Outcomes for implementation research: Conceptual distinctions, measurement challenges, and research agenda. *Administration and Policy in Mental Health and Mental Health Services Research*, *38*(2), 65–76. https://doi.org/10.1007/s10488-010-0319-7

Randall, E. T., & Bohnert, A. M. (2009). Organized activity involvement, depressive symptoms, and social adjustment in adolescents: Ethnicity

and socioeconomic status as moderators. *Journal of Youth and Adolescence*, *38*(9), 1187–1198. https://doi.org/10.1007/s10964-009-9417-9

Reichow, B., Steiner, A. M., & Volkmar, F. (2012). Social skills groups for people aged 6 to 21 with autism spectrum disorders (ASD). *Cochrane Database of Systematic Reviews*, *7*, 1–38. https://doi.org/10.1002/14651858.CD008511.pub2

Ringuet-Riot, C., Cuskelly, G., Auld, C., & Zakus, D. H. (2014). Volunteer roles, involvement and commitment in voluntary sport organizations: evidence of core and peripheral volunteers. In *Sport in Society* (Vol. 17, Issue 1, pp. 116–133). Taylor & Francis. https://doi.org/10.1080/17430437.2013.828902

Rispoli, M., Lang, R., Neely, L., Camargo, S., Hutchins, N., Davenport, K., & Goodwyn, F. (2013). A comparison of within- and across-activity choices for reducing challenging behavior in children with autism spectrum disorders. *Journal of Behavioral Education*, *22*(1), 66–83. https://doi.org/10.1007/s10864-012-9164-y

Roberts, N., & Birmingham, E. (2017). Mentoring university students with ASD: A mentee-centered approach. *Journal of Autism and Developmental Disorders*, *47*(4), 1038–1050. https://doi.org/10.1007/s10803-016-2997-9

Rothman, A. J., & Haydon, K. C. (2006). Strategies to motivate behavior change: How can we mobilize adults to promote positive youth development? In *Mobilizing Adults for Positive Youth Development* (pp. 101–114). Springer US.

Roux, A. M., Shattuck, P. T., Cooper, B. P., Anderson, K. A., Wagner, M., & Narendorf, S. C. (2013). Postsecondary employment experiences among young adults with an autism spectrum disorder. *Journal of the American Academy of Child & Adolescent Psychiatry*, *52*(9), 931–939. https://doi.org/10.1016/j.jaac.2013.05.019

Savage, J. (2000). Ethnography and health care. *BMJ*, *321*, 1400–1402.

Schaefer, D. R., Simpkins, S. D., Vest, A. E., & Price, C. D. (2011). The contribution of extracurricular activities to adolescent friendships: New insights through social network analysis. *Developmental Psychology*, *47*(4), 1141–1152. https://doi.org/10.1037/a0024091

Scirra. (2019). *Construct 2 (Version r279)* (No. r279). https://www.scirra.com/construct2/releases/r279/download

Scott, M., Falkmer, M., Falkmer, T., & Girdler, S. (2018). Evaluating the effectiveness of an autism-specific workplace tool for employers: A randomised controlled trial. *Journal of Autism and Developmental Disorders*, *48*(10), 3377–3392. https://doi.org/10.1007/s10803-018-3611-0

Scott, M., Milbourn, B., Falkmer, M., Black, M., Bölte, S., Halladay, A., Lerner, M., Taylor, J. L., & Girdler, S. (2018). Factors impacting employment for people with autism spectrum disorder: A scoping review. *Autism*. https://doi.org/10.1177/1362361318787789

Seligman, M. (2011). *Flourish: a visionary new understanding of happiness and well-being*. Free Press.

Shattuck, P. T., Narendorf, S. C., Cooper, B., Sterzing, P. R., Wagner, M., & Taylor, J. L. (2011). Postsecondary education and employment among youth with an autism spectrum disorder. *Pediatrics*, *129*(6), 1042–1049. https://doi.org/10.1542/peds.2011-2864

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for Information*, *22*, 63–75.

Shogren, K. A., & Plotner, A. J. (2012). Transition planning for students with intellectual disability, autism, or other disabilities: Data from the national longitudinal transition study-2. *Intellectual and Developmental Disabilities*, *50*(1), 16–30. https://doi.org/10.1352/1934-9556-50.1.16

Shogren, K. A., Wehmeyer, M. L., Palmer, S. B., Rifenbark, G. G., & Little, T. D. (2015). Relationships between self-determination and postschool outcomes for youth with disabilities. *The Journal of Special Education*, *48*(4), 256–267. https://doi.org/10.1177/0022466913489733

Silver, M., & Oakes, P. (2001). Evaluation of a new computer intervention to teach people with autism or Asperger syndrome to recognize and predict emotions in others. *Autism*, *5*(3), 299–316. https://doi.org/10.1177/1362361301005003007

Smith, T. (2011). Individualizing the general education curriculum. In T. Smith (Ed.), *Making inclusion work for students with autism spectrum disorders : An evidence-based guide* (pp. 167–197). Guildford Publications.

Spek, A. A., & Velderman, E. (2013). Examining the relationship between autism spectrum disorders and technical professions in high functioning adults. *Research in Autism Spectrum Disorders*, *7*(5), 606–612. https://doi.org/10.1016/j.rasd.2013.02.002

Steinhausen, H. C., Mohr Jensen, C., & Lauritsen, M. B. (2016). A systematic review and meta-analysis of the long-term overall outcome of autism spectrum disorders in adolescence and adulthood. *Acta Psychiatrica Scandinavica*, *133*(6), 445–452. https://doi.org/10.1111/acps.12559

Stukas, A. A., Daly, M., & Cowling, M. J. (2005). Volunteerism and social capital: A functional approach. *Australian Journal on Volunteering*, *10*(2), 35–44.

Sturm, D., Kholodovsky, M., Arab, R., Smith, D. S., Asanov, P., & Gillespie-Lynch, K. (2019). Participatory design of a hybrid kinect game to promote collaboration between autistic players and their peers. *International Journal of Human-Computer Interaction*, *35*(8), 706–723. https://doi.org/10.1080/10447318.2018.1550180

Tanaka, J. W., Wolf, J. M., Klaiman, C., Koenig, K., Cockburn, J., Herlihy, L., Brown, C., Stahl, S., Kaiser, M. D., & Schultz, R. T. (2010). Using computerized games to teach face recognition skills to children with autism spectrum disorder: The Let's Face It! program. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *51*(8), 944–952. https://doi.org/10.1111/j.1469-7610.2010.02258.x

Taylor, J. L., Henninger, N. A., & Mailick, M. R. (2015). Longitudinal patterns of employment and postsecondary education for adults with autism and

average-range IQ. *Autism: The International Journal of Research and Practice*, *19*(7), 785–793. https://doi.org/10.1177/1362361315585643

Taylor, J. L., & Seltzer, M. M. (2011). Employment and post-secondary educational activities for young adults with autism spectrum disorders during the transition to adulthood. *Journal of Autism and Developmental Disorders*, *41*(5), 566–574. https://doi.org/10.1007/s10803-010-1070-3

Test, D. W., Mazzotti, V. L., Mustian, A. L., Fowler, C. H., Kortering, L., & Kohler, P. (2009). Evidence-based secondary transition predictors for improving postschool outcomes for students with disabilities. *Career Development and Transition for Exceptional Individuals*, *32*(3), 160–181. https://doi.org/10.1177/0885728809346960

Test, David W, Smith, L. E., & Carter, E. W. (2014). Equipping youth with autism spectrum disorders for adulthood: Promoting rigor, relevance, and relationships. *Remedial & Special Education*, *35*(2), 80–90. https://doi.org/10.1177/0741932513514857

Thompson, C., Falkmer, T., Evans, K., Bölte, S., & Girdler, S. (2018). A realist evaluation of peer mentoring support for university students with autism. *British Journal of Special Education*, *45*(4), 412–434. https://doi.org/10.1111/1467-8578.12241

Tirrell, J. M., Dowling, E. M., Gansert, P., Buckingham, M., Wong, C. A., Suzuki, S., Naliaka, C., Kibbedi, P., Namurinda, E., Williams, K., Geldhof, G. J., Lerner, J. V., King, P. E., Sim, A. T. R., & Lerner, R. M. (2019). Toward a measure for assessing features of effective youth development programs: contextual safety and the “Big Three” components of positive youth development programs in Rwanda. *Child and Youth Care Forum*, *49*(2). https://doi.org/10.1007/s10566-019-09524-6

Ulke-Kurkcuoglu, B., & Kircaali-Iftar, G. (2010). A comparison of the effects of providing activity and material choice to children with autism spectrum disorders. *Journal of Applied Behavior Analysis*, *43*(4), 717–721. https://doi.org/10.1901/jaba.2010.43-717

van der Zee, E., & Derksen, J. J. L. (2021). The power of systemizing in

autism. *Child Psychiatry and Human Development*, *52*(2), 321–331. https://doi.org/10.1007/s10578-020-01014-4

Virnes, M., Kärnä, E., & Vellonen, V. (2015). Review of research on children with autism spectrum disorder and the use of technology. *Journal of Special Education Technology*, *30*(1), 13–27. https://doi.org/10.1177/016264341503000102

Wagner, M., Newman, L., Cameto, R., Javitz, H., & Valdes, K. (2012). A national picture of parent and youth participation in IEP and transition planning meetings. *Journal of Disability Policy Studies*, *23*(3), 140–155. https://doi.org/10.1177/1044207311425384

Wainer, J., Ferrari, E., Dautenhahn, K., & Robins, B. (2010). The effectiveness of using a robotics class to foster collaboration among groups of children with autism in an exploratory study. *Personal and Ubiquitous Computing*, *14*(5), 445–455. https://doi.org/10.1007/s00779-009-0266-z

Walsh, M. E., & Backe, S. (2013). School–university partnerships: Reflections and opportunities. *Peabody Journal of Education*, *88*(5), 594–607. https://doi.org/10.1080/0161956X.2013.835158

Wanneroo Times. (2021). *Coding "dojos" helping Perth students with autism develop new skills*. https://www.perthnow.com.au/community-news/wanneroo-times/coding-dojos-helping-perth-students-with-autism-develop-new-skills-c-2473207

Watanabe, M., & Sturmey, P. (2003). The effect of choice-making opportunities during activity schedules on task engagement of adults with autism. *Journal of Autism and Developmental Disorders*, *33*(5), 535–538. https://doi.org/10.1023/A:1025835729718

Wehman, P., Schall, C., Carr, S., Targett, P., West, M., & Cifu, G. (2014). Transition from school to adulthood for youth with autism spectrum disorder. *Journal of Disability Policy Studies*, *25*(1), 30–40. https://doi.org/10.1177/1044207313518071

Wei, X., Yu, J. W., Shattuck, P., McCracken, M., & Blackorby, J. (2013).

Science, technology, engineering, and mathematics (STEM) participation among college students with an autism spectrum disorder. *Journal of Autism and Developmental Disorders*, *43*(7), 1539–1546. https://doi.org/10.1007/s10803-012-1700-z

Westbrook, J. D., Fong, C. J., Nye, C., Williams, A., Wendt, O., & Cortopassi, T. (2015). Transition services for youth with autism: A systematic review. *Research on Social Work Practice*, *25*(1), 10–20. https://doi.org/10.1177/1049731514524836

Wilson, J., Mandich, A., Magalhaes, L., & Gain, K. (2018). Concept mapping and the CO-OP approach with adolescents with autism spectrum disorder: Exploring participant experiences. *The Open Journal of Occupational Therapy*, *6*(4). https://doi.org/10.15453/2168-6408.1455

World Health Organization. (2007). *International classification of functioning, disability and health: Children and youth version: ICF-CY*. World Health Organization.

Wright, C., Diener, M. L., Dunn, L., Wright, S. D., Linnell, L., Newbold, K., D'Astous, V., & Rafferty, D. (2011). SketchUp™: A technology tool to facilitate intergenerational family relationships for children with autism spectrum disorders (ASD). *Family and Consumer Sciences Research Journal*, *40*(2), 135–149. https://doi.org/10.1111/j.1552-3934.2011.02100.x

Wright, C., Diener, M., Wright, S., Rafferty, D., & Taylor, C. (2018). Peer teachers with autism teaching 3D modeling. *International Journal of Disability, Development and Education*, *66*(4), 438–453. https://doi.org/10.1080/1034912X.2018.1540770

Wright, S. D., D'Astous, V., Wright, C. A., & Diener, M. L. (2012). Grandparents of grandchildren with autism spectrum disorders (ASD): Strengthening relationships through technology activities. *The International Journal of Aging and Human Development*, *75*(2), 169–184. https://doi.org/10.2190/AG.75.2.d

Zwart, F. S., Vissers, C. T. W. M., Kessels, R. P. C., & Maes, J. H. R. (2018). Implicit learning seems to come naturally for children with autism, but not

for children with specific language impairment: Evidence from behavioral and ERP data. *Autism Research*, *11*(7), 1050–1061. https://doi.org/10.1002/aur.1954

Appendices

Appendix A Human Ethics Committee Approval

Curtin University

Office of Research and Development

GPO Box U1987
Perth Western Australia 6845

Telephone +61 8 9266 7863
Facsimile +61 8 9266 3793
Web research.curtin.edu.au

06-Jun-2017

Name: Sonya Girdler
Department/School: School of Occupational Therapy and Social Work
Email: Sonya.Girdler@curtin.edu.au

Dear Sonya Girdler

RE: Amendment approval
Approval number: HRE2017-0147

Thank you for submitting an amendment request to the Human Research Ethics Office for the project **The development and evaluation of a strengths-based extracurricular STEAM program for adolescents with autism spectrum disorder**.

Your amendment request has been reviewed and the review outcome is: **Approved**

The amendment approval number is HRE2017-0147-04 approved on 06-Jun-2017.

The following amendments were approved:
This amendment is not proposing any changes but comprise the developed proposed interview guides/sociodemographic questions as stated in the original application "Discussion guides will be developed in consultation with the Curtin Autism Research Group (CARG) reference group and key stakeholders. All discussions will be audio recorded and transcribed verbatim. Socio-demographic data will be gathered from participants using the variables from the Socio-Economic Indexes"

Any special conditions noted in the original approval letter still apply.

Standard conditions of approval

1. Research must be conducted according to the approved proposal
2. Report in a timely manner anything that might warrant review of ethical approval of the project including:
   - proposed changes to the approved proposal or conduct of the study
   - unanticipated problems that might affect continued ethical acceptability of the project
   - major deviations from the approved proposal and/or regulatory guidelines
   - serious adverse events
3. Amendments to the proposal must be approved by the Human Research Ethics Office before they are implemented (except where an amendment is undertaken to eliminate an immediate risk to participants)
4. An annual progress report must be submitted to the Human Research Ethics Office on or before the anniversary of approval and a completion report submitted on completion of the project
5. Personnel working on this project must be adequately qualified by education, training and experience for their role, or supervised
6. Personnel must disclose any actual or potential conflicts of interest, including any financial or other interest or affiliation, that bears on this

project

7. Changes to personnel working on this project must be reported to the Human Research Ethics Office
8. Data and primary materials must be retained and stored in accordance with the Western Australian University Sector Disposal Authority (WAUSDA) and the Curtin University Research Data and Primary Materials policy
9. Where practicable, results of the research should be made available to the research participants in a timely and clear manner
10. Unless prohibited by contractual obligations, results of the research should be disseminated in a manner that will allow public scrutiny; the Human Research Ethics Office must be informed of any constraints on publication
11. Ethics approval is dependent upon ongoing compliance of the research with the Australian Code for the Responsible Conduct of Research, the National Statement on Ethical Conduct in Human Research, applicable legal requirements, and with Curtin University policies, procedures and governance requirements
12. The Human Research Ethics Office may conduct audits on a portion of approved projects.

Should you have any queries regarding consideration of your project, please contact the Ethics Support Officer for your faculty or the Ethics Office at hrec@curtin.edu.au or on 9266 2784.

Yours sincerely

Dr Catherine Gangell
Manager, Research Integrity