INSTRUCTOR IMPLEMENTED POSITIVE BEHAVIOUR SUPPORT

IN A FITNESS PROGRAM FOR ADOLESCENTS AND ADULTS WITH AUTISM

by

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ABSTRACT

Research indicates that there is a need for fitness and recreational opportunities for adolescents and young adults with autism. There is also research indicating there is a need for instructor training in the areas of behaviour support, communication strategies, and curriculum development. The study investigated the effectiveness of the I CAN Get fit program, a community-based group fitness program for adolescents and young adults with autism. The program uses Behavioural Skills Training (BST) to teach fitness instructors to implement Positive Behaviour Support (PBS) to support the participation of individuals with autism. Fourteen adolescents and young adults with autism and eight fitness instructors participated in the study. A randomized control trial with a waitlist control group evaluated the effects of the I CAN Get Fit program. Dependent measures included instructor fidelity of implementation of PBS strategies, and participant engagement, problem behavior, physical fitness, social relationships and community participation. Direct observation data and assessment instrument-based data were gathered across three assessment periods: Baseline, post-intervention and follow-up. Results documented statistically significant improvements in instructor use of PBS strategies and in participant engagement and problem behavior following implementation of the fitness program. However, no change within or between groups was evidenced in physical fitness and in community participation. Although improvement was shown in interpersonal relationships post-intervention for both groups, these changes were non-significant when compared to the first baseline. Results are discussed in terms of relations and unique contributions to the literature, implications for the provision of community-based fitness programs to adolescents and young adults with autism, limitations and cautions, and future research.

PREFACE

This thesis study is original intellectual product of the author, T. Rodas. All work and associated methods were approved by the University of British Columbia's Behavioural Research Ethics Board [certificate # H16-01556].

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

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CHAPTER 1: INTRODUCTION

Autism Spectrum Disorder

As defined by the DSM-V (American Psychiatric Association, 2013), autism spectrum disorder (ASD) is a neurodevelopmental disorder that is characterized by persistent impairment in social communication and social interaction, and restricted, repetitive patterns of behaviour, interests or activities. ASD, which encompasses disorders previously referred to as Autistic Disorder, Asperger's Syndrome, and Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS), includes the word *spectrum* because it can manifest in varying ways, depending on the severity of the condition, developmental level, and chronological age. (American Psychiatric Association, 2013).

Symptoms of ASD are typically recognized between 12 and 24 months of age and persist throughout the lifespan. Prevalence of ASD has increased in recent years, with reported frequencies of 110 in 10,000 children and adults, which represents 1% of the population (Brugha et al., 2011). The DSM-V criteria for autism spectrum disorder are:

(I) "Persistent deficits in social communication and social interaction across multiple contexts, manifested by the following, currently or by history, including deficits in social-emotional reciprocity, nonverbal communicative behaviours used for social interaction, and developing, maintaining, and understanding relationships.

(II) Restrictive, repetitive patterns of behaviour, interests, or activities, as manifested by at least two of the following, currently or by history, including stereotyped or repetitive motor movements, use of objects, or speech, insistence on sameness, inflexible adherence to routines, or ritualized patters of verbal or nonverbal behaviour, highly restricted,

fixated interests that are abnormal in intensity or focus, and hyper- or hypo-reactivity to sensory input or unusual interests in sensory aspects of the environment.

(III) Symptoms must be present in the early developmental period (but may not become fully manifest until social demands exceed limited capacities, or may be masked by learned strategies in later life).

(IV) Symptoms cause clinically significant impairment in social, occupational, or other important areas of current functioning

(V) These disturbances are not better explained by intellectual disability or global development delay. Intellectual disability and ASD frequently co-occur; to make comorbid diagnoses of ASD and intellectual disability, social communication should be below that expected for general developmental level"

Adults with Autism

The symptoms of ASD are often most marked in early childhood and school years, and it is common for learning to occur to compensate for the core characteristics of autism. Many individuals with autism will make improvements in behaviour and increased skills as a function of learning throughout the lifespan (American Psychiatric Association, 2013). Nonetheless, only a small portion of these individuals will live independently, and only 6% of adults with autism obtain full-time employment (Chappel & Somers, 2010). Adults with autism may continue to face challenges maintaining socially acceptable behaviour, organizing practical demands without aid, and coping with stress and anxiety (Happé and Charlton, 2012). Research has suggested quality of life can be enhanced for adults with autism by implementing interventions to reduce problem behaviour and by creating opportunities to participate in community based leisure activities (Chiang & Wineman, 2014).

Quality of Life for Individuals with Autism

Quality of life has been characterized as the degree to which an individual perceives their well-being and general satisfaction with life, which may be measured by observable levels of functioning and subjective personal perception of affective and social experience (Majnemer, Shevell, Law, Poulin, & Rosenbaum, 2008). Research has shown that individuals with developmental disabilities may have impairments that affect one's ability to enjoy a quality of life at a similar level of peers of the same age and stage of life. Quality of life is not static, and can be enhanced in a dynamic way by discovering and experiencing new opportunities and possibilities. Context specific and individualized support strategies can be used to empower adults with autism to actualize their potential (Reinders & Schalock, 2014). These strategies may include specialized training, guidance, structured opportunities, and social arrangements (Schalock, 2004).

Quality of life is considered to be a multidimensional phenomenon that applies consistently to all people. Across two decades of research, Robert Schalock and his colleagues have identified eight core domains of the quality of life construct (Schalock, 2004). These are: personal development, interpersonal relationships, community involvement, rights, physical well-being, emotional well-being, material well-being, and self-determination. Although the meaning and value of these domains may vary across different people, culturally sensitive assessment can be used to measure quality of life across cultures, as has been demonstrated through validation studies in countries such as Spain and China (Reinders & Schalock, 2014; Loja, Costa, & Menezes, 2012; Wong, Wong, Schalock, & Chou, 2011). The core quality of life domains most relevant to this proposed study are physical well-being, interpersonal relationships and community involvement. These domains are discussed below.

Physical Well-Being

The core domain of physical well-being includes self-care, physical fitness, health, and nutrition (Schalock, 2004). Physical exercise has been shown to increase appropriate behaviour, reduce problem behaviour (Lancioni & O'Reilly, 1998) and decrease stereotypic behavioural patterns (Elliot, Dobbin, Rose, & Soper, 1994) for individuals with autism. For example, Sowa and Meulunbroek (2012) conducted a meta-analysis of 16 studies that evaluated the effects of physical activity on behavioural outcomes for individuals with autism between the ages of 4 and 41 years old. In addition to improving health, muscle tone, and energy, positive behavioural outcomes, results indicated that overall physical activity yielded positive changes in behaviour including improvements in social behaviour, communication skills, academic engagement, and sensory skills. Lang et al. (2010) conducted a systematic review of 18 studies involving physical exercise and individuals with autism between the ages of 3 and 41 years old. The results of this study also indicated that exercise contributed to positive physical and behavioural outcomes. In terms of physical health, exercise was associated with increases in endurance, strength, flexibility, and aerobics. Behavioural improvements were demonstrated in academic engagement, accuracy, and on-task behaviour. In addition, results indicated that exercise was associated with decreases in stereotypy in 11 of the 18 studies, as well as reduced self-injury and disruptive behaviour.

Interpersonal Relationships and Social Inclusion

The domain of interpersonal relationships includes having a social network of meaningful relationships, positive social interactions, and a support system of people who can provide emotional, physical, and financial support and advice. The domain of social inclusion includes

community integration, community participation, community contribution, and support network services (Schalock, 2004). While some individuals with autism have social deficits as a result of a lack of social motivation, many individuals are highly motivated to form meaningful and significant social hips, but lack the skills to do so. The consequences of lacking these social skills can present in the form of peer rejection, peer victimization, poor social support, isolation and loneliness (Laugeson & Ellingsen, 2014). Developing and maintaining interpersonal relationships and increasing social competence can enable individuals to function successfully in broader contexts, resulting in increased social inclusion. For example, Osrmond, Krauss, and Selzter (2004) conducted a longitudinal study that investigated peer relationships and participation in social and recreational activities. The study included the families of 235 individuals with autism that lived at home and were between the ages of 10 and 47 years, with the mean age being 19 years old. Results of this study showed that only 19 individuals in the sample (8.1%) had at least one peer of the same age that they engaged in reciprocal activities outside of organized settings. One fifth (20.9%) reported to have at least one peer relationship that involved some activity outside of prearranged settings. One quarter (24.3%) reported to having peer relationships in only prearranged settings. Most importantly, a staggering 109 individuals (46.6%) reported to have no reciprocal peer relationships of any nature within or outside of prearranged activities. Results also showed that approximately three quarters of the sample were active. One third of the sample (38.5%) engaged in group activities or religious activities, and these were mostly facilitated by parents and caregivers. Fewer individuals engaged in informal socializing with relatives (22.6%), friends (20.9%), or with people from school or work (13.2%). Osrmond et al. (2004) also reported that there was a significant correlation between participation in social and recreational events and the frequency of friendships. When

reciprocal social interaction skills were less impaired, increased participation in social and recreational activities was predicted. These results suggest the potential value of group recreation programs for adolescents and adults with autism and developmental disabilities, particularly programs that target opportunities for reciprocal social interaction.

Access to Community Recreation Programs

While research informed knowledge about the effects of physical activity on individuals with autism and other developmental disabilities is growing (Lancioni & O'Reilly, 1998) there is little research on how to best train staff in supporting these individuals in community recreation programs focused on physical activity. Community recreation providers are experts in teaching the skills of the physical fitness or sport activity for which they have expertise. However, as individuals with autism often present with learning difficulties and challenging behavior, community recreation providers require additional skills in instructional technology and behaviour management to work with these individuals. The absence of these skills in service providers can result in a lack of accessible community recreation programs for individuals with autism. A literature search in PsychInfo for the keywords "staff training" and "autism" yielded 100 articles between the years of 1996 and 2016, none of which were related to staff training in community recreation settings. A literature search in SportDiscus for the keywords "training" and "autism" yielded 106 articles between the years of 1972 and 2016, also with no research to be found that indicated *how* to teach community recreation staff to work with individuals with autism. In SportDiscus, there was one study that suggested *what* to teach community recreation staff working with individuals with autism. Healy, Judge, Block, and Kwon (2016) conducted a survey with 106 certified adapted physical educators that highlighted the need for training for adapted physical education specialists. The majority of participants in the study held degrees in

health and physical education (66%), kinesiology (9%), special education (2%), exercise science (4%), and movement (1%). Results of the study showed that 83% of the participants did not take a specific course in teaching physical education to individuals with autism and identified behavior management, communication strategies, and curriculum development as areas in which they believed they required further training. Furthermore, respondents identified knowledge of the characteristics of autism, assessment, positive behavior support strategies, motivational strategies, and methods for adapting activities as competencies necessary to teach students with autism.

There also is growing clinical interest from community recreation providers to learn how to best support individuals with autism in the community recreation setting, as evidenced by a growing number of workshops and resources across Canada. For example, the 2016 Canadian Sport for Life National Summit featured the topic of autism, including the partnership between two non-profit organizations that offer sports programs for individuals with autism and disabilities: Special Olympics Canada and the Canucks Autism Network located in British Columbia. These two organizations have worked together to create an autism module to educate coaches on what autism looks like in the sport setting, and how to provide support to individuals with autism in sport (Sport for Life, 2016). Given the growing clinical interest in training community recreation providers, there is a clear need for empirical evidence to identify best practices in this area.

There are two empirically supported practices that have much promise for community recreation staff to support individuals with autism in community recreation programs. The first is Behavioural skills training (BST), an instructional strategy that has shown to be effective in teaching parents and educators skills to work with individuals with autism and other

developmental disabilities in the home, school, and community setting (Shayne & Miltenberger, 2013; Miller, Crosland & Clark, 2014; Jull & Mirenda, 2015). The second is Positive Behaviour Support (PBS), a science-based and values-informed approach to making meaningful and lasting changes in an individual's behaviour and quality of life (Lucyshyn, Dunlap & Freeman, 2015). The two practices, BST and PBS, are discussed in more detail below.

Behavioural Skills Training (BST)

Behavioural skills training (BST) is an approach to teaching new skills that combines four strategies: instruction, modeling, role-play or behavioural rehearsal, and feedback. Instruction involves providing a learner with information that helps him or her understand how to engage in the target behaviour. Instruction is presented in a manner that matches the learner's comprehension and ability level. In addition, the learner is prompted to repeat the instruction to indicate an accurate understanding of the instruction, as well as to increase the likelihood that the learner is able to self-prompt the target behaviour at a later time. Modeling provides a demonstration of the target behaviour for the learner. Modeling can be live, on audio, or on video, and is most effective when: (a) conducted in the actual performance setting; (b) presented in a variety of ways to enhance generalization; and (c) the learner is reinforced for engaging in the modeled behaviour. Role-play or rehearsal provides an opportunity for the learner to practice the behaviour, as well as for the instructor to assess the learner's performance. Role-play or rehearsal should be programmed for success, occur in the proper context, and include reinforcement for target behaviour. Feedback follows the learner's performance immediately, providing error correction or further instruction for improvements. Feedback should always include praise and provide corrective information that informs the learner how to improve his or her performance (Miltenberger, 2012).

Research has shown that BST has been effectively used to teach parents to conduct functional assessments (Shayne & Miltenberger, 2013), to treat food selectivity (Seiverling, Williams, Sturmey & Hart, 2012), and to teach safety skills (Harriage, Cho Blair & Miltenberger, 2016). BST also has been effectively used to teach school personnel to implement classroom management practices (Miller et al., 2014), to teach social skills (Kassardjian et al., 2014), and to increase child language development (Gianoumis, Seiverling & Sturmey, 2012). To date only one study, conducted by Jull and Mirenda, has incorporated BST to train community recreation staff to teach a physical activity to individuals with autism and developmental disabilities.

Jull and Mirenda (2015) conducted a modified, non-concurrent multiple baseline design to demonstrate the efficacy of BST in teaching swimming instructors to use discrete trial teaching and visual activity schedules to teach children with autism swimming skills in public pools. Participants included six swimming instructors who were certified lifeguards and eight children diagnosed with autism. The intervention included providing the six instructors with a 3-hour, in-class workshop in behavioural support strategies, followed by 2.5 hr of *in vivo* coaching across ten 30 min swimming lessons.

Results of this study showed that during baseline, instructors' use of key skills such as visual schedules, prompts, praise, rapport-building activities, and clear instructions was low (M=36.5). After intervention, improvements were shown across all of these instructional skills (M=83.4). For child swimming skill acquisition, across the eight children 18% to 100% of skills assessed in baseline improved by at least one level during intervention. Seven of the eight children demonstrated increases in both new and established skills, while the eighth child showed increases in only established skills. Instructors rated this intervention with high social

validity (M=4.6 on a 5-point scale), and commented that they believed this training should be mandatory for swimming instructors working with children with special needs. Parents also rated the intervention with high social validity (M=4.8). They commented that they hoped more training would be available at community pools and that the training should be offered to other recreation service providers such as gymnastics, skating, skiing, and biking instructors. The results of this study demonstrated that providing training to instructors using BST paired with *in vivo* coaching is effective and efficient in increasing both instructor and child skill acquisition.

Positive Behaviour Support (PBS)

PBS is a science-based and values-informed approach to addressing challenging behaviour that incorporates applied technologies of behaviour change and instruction that have been validated by empirical research (Lucyshyn et al., 2015). Using the scientific discipline of applied behaviour analysis (ABA) as a foundation for assessment and intervention design, PBS also integrates principles from other disciplines such as biomedical science and developmental psychology. As a values-informed approach, strategies used in PBS are based on the goals, preferences, and context of the individual receiving support, and by his or her parents, teachers, and/or support workers. Behavioural support plans are developed, implemented, and evaluated in collaboration with key stakeholders, and interventions are designed to be acceptable, feasible, and effective when used by natural change-agents in natural settings in the home, school and community (Lucyshyn et al., 2015).

Positive Behaviour Support emphasizes the use of educative and reinforcement-based interventions, with the majority of focus on proactive, preventative strategies. A functional assessment provides an understanding of the variables associated with problem behaviour and

the information necessary to develop an effective behaviour support plan (Lucyshyn et al., 2015). A competing behaviour pathways model provides an understanding of the features of the environment, which set the stage for, occasion, and maintain problem behaviour. The pathways diagram also provides an understanding of the features of a solution, including desired behaviour, consequences that will strengthen desired behaviour, and alternative replacement behaviour that serves the same function as problem behaviour. Based on functional assessment results, multicomponent PBS plans are designed to render problem behaviour irrelevant and ineffective at achieving its function or purpose. PBS plans include setting event strategies, antecedent strategies, teaching strategies, and consequence strategies. At an individual level, PBS is used to increase an individual's successful inclusion and competence in school and community settings, ability to communicate his or her wants and needs, and overall quality of life. At a systems level, PBS is used to strengthen organizational or family systems to create environments in which behaviour support plan strategies can be implemented with fidelity and sustained over time (Lucyshyn et al., 2015).

There is a strong body of experimental research documenting the effectiveness of PBS in family (Buschbacher, Fox, & Clarke, 2004; Clarke, Dunlap & Vaughn, 1999; Duda, Clarke, Fox, & Dunlap, 2008; Durand, Hieneman, Clarke, Wang & Rinaldi, 2012; Fettig, Schultz, & Srechkovic, 2015; Vaughn, Wilson, & Dunlap, 2002) and school (Bradshaw, Mitchell & Leaf, 2010; DePry & Sugai, 1998; Ervin, DuPaul, Kern, & Friman, 1998; Horner et al., 2009; Lewis, Sugai & Colvin, 2000; Bradshaw, Mitchell & Leaf, 2010; Strickland-Cohen & Horner, 2015) settings. Despite the richness of empirical support for PBS in these natural settings, there remains no research on the effectiveness of PBS in community recreation settings with individuals with autism and other developmental disabilities. One community recreation setting that has anecdotal

evidence of the effectiveness of both BST and PBS in supporting children and youth with autism in physical exercise and sport activities is the Canucks Autism Network.

Canucks Autism Network

The Canucks Autism Network (CAN) is a non-profit organization that provides sports, art, and social programs for individuals with autism and their families (Canucks Autism Network, 2015). CAN is becoming recognized across Canada because of its comprehensive strategy for building capacity for community recreation providers to support individuals with autism (Canadian ASD Alliance, 2015). To prepare community recreation providers to support individuals with ASD to successfully participate in sport and physical fitness programs, supervisory staff implement BST to train support workers in the use of PBS with the children, youth and young adults who participate in the programs. Doing so also is consistent with adapted physical educators' views about the competencies necessary to successfully include individuals with autism in community recreation programs (Healy et al., 2016). In addition to thorough training in these competencies for all support workers at CAN, the organization also offers this training to other community recreation providers across British Columbia, Canada. Anecdotal evidence of the effectiveness of this training may be seen in numerous testimonials by parents and requests for training by community recreation providers (Canucks Autism Network, 2016). However, there is no empirical evidence to date that this program is effective.

Given the dearth of research that documents the effectiveness of community recreation programs for individuals with autism, there is a need to empirically investigate such programs. In collaboration with the Canucks Autism Network, this study investigated the effectiveness of a fitness program called "I CAN Get Fit," which included the use of BST to provide fitness

instructors with training in PBS to support adolescents and young adults with autism in a group fitness setting over a 6-week period.

Research Questions

In this study, I investigated the effects of the I CAN Get Fit program on: (a) the ability of fitness instructors to implement PBS strategies during I CAN Get Fit sessions, after having been taught through BST to use such strategies; (b) the effects of instructor implementation of PBS on participant engagement and problem behaviour; and (c) the fitness and social/leisure experiences and skills of adolescents and adults with autism.

The study addressed four research questions related to training fitness instructors to implement PBS strategies with adolescents and adults with autism:

(a) Will the use of BST to teach instructors to use PBS yield a statistically significant increase in instructor use of PBS strategies with fidelity during post-intervention assessment and follow-up when compared to baseline assessment?

(b) Will instructor implementation of PBS strategies yield a statistically significant increase in participant engagement and decrease in problem behaviour for adolescents and adults with autism during post-intervention assessment and follow-up when compared to baseline assessment?

(c) Will there be a statistically significant increase in participant engagement and decrease in problem behaviour in the experimental group when compared to the waitlist control group?

(d) Do fitness instructors view I CAN Get Fit as socially valid; that is, do they view the goals, procedures and outcomes of the program to be important, acceptable and feasible?

The study also addressed four additional research questions related to I CAN Get Fit for the adolescents and adults with autism:

(a) Will participation in I CAN Get Fit yield a statistically significant improvement in physical fitness, interpersonal relationships, and community involvement for adolescents and adults with autism during post-intervention and follow-up, when compared to baseline assessment?
(b) Will there be a statistically significant difference in physical fitness, interpersonal relationships, and community involvement in the experimental group when compared to the waitlist control group?
(c) Do the adolescents and adults with autism participating in I CAN Get Fit view the program as socially valid?
(d) Do the parents/care providers of the adolescents and adults with autism participating in I CAN Get Fit view the program as socially valid; that is, do they view the goals, procedures and outcomes of the program to be important, acceptable and feasible?

Hypotheses

I hypothesized that implementing BST with I CAN Get Fit instructors would lead to statistically significant increases in accurate instructor use of PBS strategies. I also hypothesized that instructor implementation of Positive Behaviour Support would lead to statistically significant improvements in participant engagement and problem behaviour. I also hypothesized

that implementation of I CAN Get Fit would lead to statistically significant improvements for adolescents and adults with autism in physical fitness, interpersonal relationships, and participation in community-based leisure activities. I also predicted that the social validity of the I CAN Get Fit program would be high; that is, participants, instructors, and the parents of participants would view the goals, procedures and outcomes of the program to be important and acceptable. If these results were obtained, the study would have significant implications for professionals who support adults with autism in leisure recreational settings.

CHAPTER 2: METHOD

Recruitment

Twenty-two participants participated in this study. Fourteen participants were adolescents and adults with autism between the ages of 16 and 26 who participated in the I CAN Get Fit program. In addition, eight kinesiology students were recruited to be fitness instructors for the I CAN Get Fit program. The procedures for recruiting I CAN Get Fit participants and fitness instructors are described below.

Participant Recruitment

For the purpose of this study, adolescents and adults with autism are referred to as "participants." Fourteen individuals with autism were recruited through the Canucks Autism Network. To create congruency with the type of participants of which community recreation programs are comprised, six of the participants had a history of little to no problem behaviour, and eight of the participants had a history of mild to moderate problem behaviour. This is the typical make-up of Canucks Autism Network programs, and is a realistic and feasible composition of participants for a program such as I CAN Get Fit.

The Canucks Autism Network e-mailed all families with members between the ages of 16-35. The letter described the general purpose of the study, criteria for participation, time involved, and basic information about the procedures involved in the study (See Appendix A). To be eligible for the study, the participants:

(a) had a formal diagnosis of autism

(b) were a registered member of the Canucks Autism Network

(c) were between the ages of 16-35

(d) were willing to submit a Physical Activity Readiness Questionnaire Plus (PAR-Q Plus) prior to the start of the program

(e) for approximately half of the participants, had a history of little to no challenging behaviour in home, school, or community settings; and had not caused injury to themselves, another person, or resulted in property destruction within the past year

(f) for approximately half of the participants, had a history of mild to moderate challenging behaviour in home, school, or community settings; and had not caused injury to themselves, another person, or resulted in property destruction within the past year

(g) were willing to commit to attend all sessions for the duration of the program

(h) were willing to sign the UBC BodyWorks Facility Centre waiver form

In addition, the self-advocate or participant's parent/guardian:

(a) were willing to complete assessment instruments and questionnaires prior to, during, and following the study (i.e., Resident Lifestyle Inventory, Social Network Analysis Form, and Social Validity)

Individuals were excluded from the study if they:

(a) were younger than 16 or older than 35 years old

(b) had a history of severe challenging behaviour that had resulted injury to themselves, another person, or resulted in property destruction within the past year

(c) had been diagnosed with other developmental and/or physical disabilities that would hinder their ability to participate in a physical fitness program of this nature (e.g., Cerebral Palsy, Down Syndrome, Fetal Alcohol Syndrome)

Families who respond to the recruitment letter were invited to provide permission to be contacted by the researcher, who invited them to fill out and submit a participant information form. The participant information form identified whether the participant was eligible for the research study. Eligible participants received additional information from the investigator regarding the purpose, procedures, and timeline of the study. They were then provided with an opportunity to ask questions and read an informed consent form. The informed consent form for parents/guardians included consent for participation in all activities of I CAN Get Fit. The informed consent form also requested permission for the researcher to release demographic and personal information gathered by the Canucks Autism Network, with names and identifying information omitted. Participants with autism were invited to sign an informed assent form. This involved reading to the prospective participant a simplified version of the study with visual pictures explaining the most important features of consent, such as study procedure, risks and benefits, and the right to withdraw. Table 1 below displays participant demographic information.

Table 1

Participant Gender, Medical Conditions, Communication, and Physical Limitations

Group	Gender	Medical Conditions	Communication	Physical Limitations
Experimental				
1	M	N/A	3-5 Word Phrases	N/A
2	M	ADHD, Anxiety	Full Sentences	N/A
3	M	Type 1 Diabetes	Full Sentences	N/A
4	M	ADHD, Anxiety	Full Sentences	N/A
5	M	N/A	Full Sentences	N/A
6	F	N/A	Full Sentences	N/A
7	M	N/A	Full Sentences	N/A
Waitlist				
1	M	Epilepsy	Full Sentences	N/A
2	M	Epilepsy, Unspecified Psychatric Disorder	Full Sentences	N/A
3	F	N/A	3-5 Word Phrases	N/A
4	M	N/A	3-5 Word Phrases	N/A
5	M	N/A	Full Sentences	Limited upper body strength
6	M	Epilepsy, Hypothyroid	Full Sentences	Vision
7	M	N/A	Full Sentences	N/A

Note. Unshaded lines = Individuals with mild to moderate problem behaviour; Shaded lines = Individuals with little to no problem behaviour

Instructor Recruitment

For the purpose of this study, individuals participating in the study as fitness instructors were referred to as "instructors." Instructors were recruited through the UBC Kinesiology department. A letter was e-mailed to kinesiology students, as well as posted in the kinesiology department building. The letter described the general purpose of the study, criteria for participation, time involved, and basic information about study procedures (See Appendix B). To be eligible for the study, the instructors:

(a) were enrolled as a student at UBC, preferably in the Kinesiology or related department
(b) had no formal coursework in Positive Behaviour Support or applied behaviour analysis
(c) had prior experience instructing a sport or fitness activity
(d) had a Personal Training certification from the Health and Fitness Federation of Canada (HFFC), Canadian Society for Exercise Physiology (CSEP), American College of Sports Medicine (ACSM), or equivalent
(e) were willing to commit to attend all sessions for the duration of the program
(f) obtained a criminal record check

Instructors were excluded from the study if they:

(a) were not a current UBC student
(b) had coursework or a certification in applied behaviour analysis
(c) did not have a Personal Training certification from the Health and Fitness Federation of Canada (HFFC), Canadian Society for Exercise Physiology (CSEP), American College of Sports Medicine (ACSM), or equivalent
(d) did not pass the criminal record check

Instructors who responded to the letter were asked to show their personal training certification to confirm eligibility. Eligible instructors received additional information from the investigator regarding the purpose, procedures, timeline of the study, and were provided with the opportunity to ask questions before being invited to sign the informed consent form.

Sampling

Eligible participants and instructors were assigned into two equal groups using stratified randomization. The experimental and waitlist groups were each randomly assigned 3 participants with little to no problem behaviour and 4 participants with mild to moderate problem behaviour. The experimental and waitlist groups were each randomly assigned 4 eligible instructors with no restrictions by the researcher.

Assignments took place at the Canucks Autism Network, and participants were enrolled and notified of their program start date via the Canucks Autism Network. Participants and instructors were blind to whether they were in the experimental group or waitlist control group. The Canucks Autism Network programs often have a limited number of spaces per program, and it is common for participants to be on a waitlist to access a program. In the same way, participants in each respective group were informed of whether they were to start the fitness program in the first (experimental) group or the second (waitlist control) group. Instructors also were blind to the conditions of the study.

Setting and Materials

In order to build capacity for serving individuals with autism in the community, the Canucks Autism Network creates partnerships with other organizations. The I CAN Get Fit program was implemented in partnership with the UBC BodyWorks Fitness Centre, a UBC Kinesiology department outreach program focused on providing evidence-based, non-competitive fitness opportunities to adults.

All sessions took place at the UBC BodyWorks Fitness Centre, an adult-oriented fitness facility focused on evidence-based practices, designed and run by the UBC School of

Kinesiology. The BodyWorks Fitness Centre provided all fitness equipment used in the study, such as mats, tension bands, exercise balls, and weights. The Canucks Autism Network paid for facility fees, instructor wages, facilitate instructor training and provided instructional materials, such as visual supports, lesson plans and worksheets, and adaptive technology. As part of the capacity building efforts, UBC BodyWorks instructors who did not participate in the I CAN Get Fit program were provided with autism and behaviour support training. The Canucks Autism Network and UBC BodyWorks Fitness Centre agreed to allow research to be conducted in the I CAN Get Fit program to investigate the effectiveness of the program.

Measurement

There were three proximal dependent variables that were directly measured. These were instructor implementation fidelity, participant engagement, and problem behaviour. In addition, there were three distal dependent variables. Physical fitness was directly measured and social relationships and community participation were indirectly measured. Lastly, participants evaluated the social validity of the I CAN Get Fit program. Dependent variables and their measurement procedures are described below.

Termination Criteria

To ensure the safety of all participants, a termination criterion was established in relation to participant problem behaviour. In collaboration with the fitness instructors, a level of intolerable problem behaviour was defined. Intolerable problem behaviour included, for example, three to five instances of minimally tolerable problem behaviour or one instance intolerable problem behaviour. Intolerable problem behaviour included instances of property destruction, physical aggression, and self-injurious behaviour. Instructors were informed of their

right to terminate the instructional session at any time during the study and a signal for termination was agreed upon. However, during the study the occasion for termination did not arise.

Dependent Measures

Dependent measures were gathered during observation sessions at three assessment periods of the study: baseline, post-intervention and follow-up. At each assessment period, two structured observations were conducted. During structured observations, participant behavior and instructor behaviour were videotaped, and data were collected for each individual in the study. For each measure, the average of the two structured observations served as the final score for that observation period. The two structured observations occurred over the period of one week. Each structured observation consisted of a 60-minute fitness session. Fitness instructors were given an in-class lesson plan template in advance, and were asked to implement the lesson plans independently. No behavioural support or advice was provided during structured observations. Exercises in each lesson plan varied slightly; however the structure of each lesson remained the same.

Instructor implementation fidelity. Instructor implementation fidelity was measured for instructor use of Positive Behaviour Support strategies and instructor implementation of fitness lesson plans. Instructor implementation fidelity of fitness lesson plan data results were not used as dependent measures in the study, but rather to ensure fidelity across all assessments. Instructor implementation fidelity measures are described below.

Instructor implementation fidelity of Positive Behaviour Support strategies. Instructor use of 14 PBS strategies was measured. These strategies addressed five categories of behaviour

support, which are setting the stage for success, preventing problem behaviour, teaching positive behaviour, strengthening positive behaviour and weakening problem behaviour. The 14 PBS strategies were: (a) incorporating games, themes, and toys into skills and activities; (b) reviewing a visual schedule of activities with the group; (c) using positively stated expectations describing desired behaviour prior to the start of activities; (d) using individualized visual or written support strategies (e.g., schedules, countdowns, token, boards, checklist, timers); (e) offering controlled choices; (f) positive contingency statements; (g) safety signals; (h) proactively prompting physical skills or activities; (i) proactively prompting communicative language; (j) proactively prompting peer interaction; (k) providing contingent praise; (l) providing contingent access to tangible reinforcers; (m) actively ignoring problem behaviour and redirecting to appropriate behaviour; and (n) redirecting minor problem behaviour to use communicative language. Operational definitions of each PBS strategies, including examples and non-examples, are presented in Table 2.

Instructor implementation fidelity of PBS strategies was coded to evaluate the instructor's ability to implement the Positive Behaviour Support strategies as intended. During an assessment period (i.e., at baseline, post-intervention and follow-up), two 60-minute sessions were videotaped. For each session, only the circuit-training portion was used for coding problem behaviour. For each instructor, a 10-minute random sample was selected for each observation session. The average of the 10-minute random samples from the two observation sessions was the score for that assessment period. If an instructor implemented one or more of the listed PBS strategies correctly, the PBS strategy was marked as "yes". If the instructors did not implement the listed strategy, it was marked as "no". If there was no opportunity for the instructor to implement the listed strategy, it was marked as "no opportunity". Percentage of correctly

implemented PBS strategies was calculated by dividing the number of strategies marked as "yes" by the total number of strategies marked as "yes" and "no", and multiplied by 100.

Table 2

Definition of Positive Behaviour Support Strategies

Strategy	Definition
Incorporate games, themes, and toys into skills	This category is scored if the instructor incorporates a game, theme or toys into skills and activities to increase motivation. The instructor must include the game, theme, or toy in the instructions. Examples: "For warm up, we are going to play Octopus tag." "We are going to pretend we are zoo animals; first walk like a bear, then an inch worm, then a crab." "Instead of throwing the balls, we're going to throw rubber chickens." Non-Examples: "Run around the gym." "Do one line of bear walks, inch worms, and crab walks." "Throw the ball to your partner."
Use group schedule	This category is scored if the instructor reviews the activities for the day with the group verbally, with pictures, or with writing. The instructor may review the entire day's schedule at once, or review portions of the activities in sections. Examples: "Today, we are going to do a group warm up, then Circuit #1, take a quick break, Circuit #2, have a quick break, then Circuit #3. At the end of the class, we will have a 5 minute cool down, then it's time to go home." "Warm up is all finished, next is Circuit #1, then we will have a break." Non-Examples: "Today we will do fitness activities. Let's get started." "Everyone run lines until I say stop."
Positively stated expectations	This category is scored if the instructor provides positively stated expectations before beginning an activity that describes the expected, desired behaviour. This category is not scored if the statement is made as corrective feedback after problem behaviour occurs. Examples: "Remember to try your best and finish every activity" "Take turns using the medicine ball, everyone gets three turns lifting it." Non-Example: "Don't bend your back when you're lifting weights" "Don't be a ball hog."

Strategy	Definition
Use individualized visual or written support strategies to increase predictability and motivation	This category is scored if the instructor provides a concrete representation (visual or written) of an instruction to increase motivation and predictability. Examples include, an individualized schedule, countdown, token board, checklist, or timers. Examples: Providing a schedule with the individual skills within an activity. Using a countdown board to keep track of how many skills are left until the participant can take a break. Using a token board to keep track of how many skills the participant needs to complete before accessing a reinforcer. Using a checklist with each skill in a Circuit, checking off each skill as it is completed. Using a timer to show the participant the duration of time required to continue the skill before the participant can take a break. Non-Example: Giving the participant the lesson plan.
Offer controlled choices	This category is scored if the instructor provides choices between 2-3 options to increase motivation. This category is not scored if the instructor does not provide choices of what the participant can do and /or leaves the question open-ended. Examples: "Would you like to start with hip raises or leg lifts?" "Would you like to be partners with Josh or Kelly?" Non-Examples: "What exercise do you want to do?" "Who do you want to be your partner?"
Positive contingency statements	This category is scored if the instructor explicitly states the expected behaviour, and what reinforcer will follow the engagement of the expected behaviour. The reinforcer can be a preferred item or activity. A positive contingency statement must be made before significant problem behaviour occurs. Examples: "First do 10 wall squats, then you can play tag for 1 minute." "After you finish Circuit #2, you can play with the light-up balls." Non-Example: "If you don't do your squats, you won't get to play tag." "Hurry up and finish Circuit #2."
Use safety signals	Instructor provides a warning of how long or how many more skills the participant needs to complete, in order to motivate them to endure the activity. A safety signal must be given before significant problem behaviour occurs. Example: "Just 3 more sit-ups, then you get a break" Non-Example: "We're going to keep doing it until you get it right"

Strategy	Definition
Proactively prompt physical skills	This category is scored if the instructor proactively provides prompts that promote correct responses to the relevant stimuli in completing a skill or activity. This includes verbal directions, physical assistance, gesturing, and live or video modeling. This is not scored if the instructor prompts the skill after problem behaviour or an error has occurred. Examples: "Now do a squat against the wall. Stand against the wall, now bend your knees like you are sitting in a chair." "Hold plank for 10 seconds, I'll help you hold your knees up." "Jump all the way over here" (Points to the spot) "Now do a lunge like this, watch me." Non-Examples: "Cynthia likes doing squats." "I'm a really fast runner." "You did that lunge incorrectly." "Can you do bear walks now?"
Proactively prompt communicative language	This category is scored if the instructor proactively prompts the participant to use language that is communicative to express what he or she wants. This is not scored if the instructor prompts language after problem behaviour has occurred. Examples: "Remember, if you get tired you can say, I need a break." "Remember, if it's too hard you can ask for help." Non-Examples: "You look like you need a break, let's go sit down." "I know you don't like sit ups, I'll help hold your feet."
Proactively prompt peer interaction	This category is scored if the instructor facilitates peer interaction by verbally, gesturally, or physically directing two or more participants to attend to a peer and engage in the same activity together. This category is not scored if participants engage in peer interaction without any instructor prompt. Examples: "Everyone get a partner and pass the medicine ball back and forth 10 times." "James, you hold Peter's feet down and give him a high five every time he comes up for a sit-up." Non-Examples: "Everyone go do your exercises." "James and Peter, be friends."
Provide contingent praise for positive behaviour	This category is scored if the instructor delivers contingent praise for desirable behaviour within 3 seconds. Praise may include an evaluative or descriptive comment, stating what the participant did correctly and what he or she will receive as reinforcement. Each discrete statement is scored, that is each sentence or phrase is scored as one instance. This category is not scored if praise is delivered after the participant engages in problem behaviour, performs an error, or is not actually engaged in the behaviour that is being descriptively praised. Example: Participant completes lunges correctly, the instructor says "Great job with the lunges! Your back was straight and your knee was perfectly over your ankle." Non-Example: Participant completes half of the lunges then runs away crying, the instructor says "Great job with the lunges!"

Strategy	Definition
Provide contingent tangible reinforcement for positive behaviour	This category is scored if the instructor delivers a contingent tangible reinforcer for desirable behaviour. Tangible reinforcers may include a preferred item or activity. Each discrete reinforcer is scored, that is each item or activity. This category is not scored if a tangible reinforcer is delivered after the participant engages in problem behaviour, performs an error, or is not actually engaged in the behaviour that is being reinforced. Example: Participants finish Circuit #2, the instructor says "Great job finishing Circuit #2! Now you get to play Chicken on the Hen House" and facilitates the Chicken on the Hen House game. Non-Example: Participants are struggling through lunges and the instructor says "Forget lunges, let's just play Chicken on the Hen House!"
Actively ignore and redirect	This category is scored if the participant engages in minor problem behaviour and the instructor actively ignores the behaviour, and redirects the participant by prompting him or her to engage in the appropriate skill or activity required by the lesson plan. This category is not scored if the instructor responds to the problem behaviour in any way, such as providing attention, a tangible, or escape to the participant. Example: The participant starts poking another participant and laughing, the instructor tells the participant "It's your turn, let's do 5 push-ups together." Non-Example: The participant starts poking another participant and laughing, the instructor says "You guys stop laughing or you'll have to sit out."
Redirect minor problem behaviour to ask for a break or help	This category is scored if the participant engages in minor problem behaviour and the instructor prompts the participant to use language that is communicative to express what he or she wants. This category is not scored if the instructor responds to the problem behaviour in any way, such as providing attention, a tangible, or escape to the participant. Example: The participant tries to walk away from the exercise circuit, the instructor says "It looks like you need a break, you can say I need a break." The participant asks for a break and they sit out for 1 minute. Non-Example: The participant tries to walk away from the exercise circuit, the instructor says "It looks like you need a break, let's go sit out."

Instructor implementation fidelity of I CAN Get Fit lesson plans. Instructor implementation fidelity of I CAN Get Fit was recorded to ensure consistency across all assessment periods. Implementation fidelity of lesson plans was defined as the coach prompting each component of the class. As Certified Personal Instructors, the instructors are equipped with the ability to create lesson plans with appropriate activities, and were provided with a lesson plan template requiring four components (See Appendix C). This structure was created in

collaboration with two BodyWorks Certified Personal Trainers who did not participate in the study. These four components included instructing (a) a group warm-up; (b) three exercise circuits, each consisting of 3-5 different exercises; (c) a group cool-down; and (d) a group stretch. A checklist of the lesson plan components was used to measure instructor implementation fidelity of I CAN Get Fit. Instructor implementation fidelity of fitness lesson plans was coded to evaluate the instructor's ability to implement the lesson plan as intended. During an assessment period, two 60-minute sessions were observed. Only the lead instructor was observed, as the lead instructor was the one providing the group instructions. If the instructor implemented the listed component, the component was marked as "yes". If the instructor did not implement the listed component, it was marked as "no". Percentage of correctly implemented components was calculated by dividing the number of components marked as "yes" by the total number of components marked as "yes" and "no", and multiplied by 100.

Instructor implementation fidelity remained consistent across assessments, indicating lesson plans were implemented with fidelity throughout the entire study for both groups. No change was demonstrated in the experimental group across Assessment I (M= 97.5%), Assessment II (M=100%), and Assessment III (M=100%) and in the waitlist control group across Assessment I (M= 100%), Assessment II (M=100%), and Assessment III (M=100%).

Participant behaviour. Measures of participant behaviour included participant engagement and problem behaviour. These are described below.

Participant engagement. Participant engagement was defined as a participant actively engaging in or attempting to engage in an I CAN Get Fit activity that was prompted by the

instructor. During an assessment period, two 60-minute sessions were recorded. The warm-up and cool-down portions of each class often varied, and participants generally trickled into each class. Therefore, for each session, only the circuit-training portion was used for coding engagement. For each participant, a 10-minute random sample was chosen for each observation session. The average of the 10-minute random samples from the two observation sessions was the score for that assessment period. Independent or prompted attempts as well as approximations to engagement in the activity were scored as participant engagement. The unit of measurement was percentage of intervals of participant engagement. A full interval recording procedure was used with a 10 s interval. If the participant was engaged in the activity that was instructed during an entire interval, it was recorded as an occurrence. If the participant engaged in behaviour unrelated to the activity at any point in the interval (e.g., playing with unrelated objects, singing, talking or texting on his or her phone) or refused to do the activity, it was recorded as a non-occurrence. For each 10-minute session sample that was observed, a percentage of intervals of participant engagement was calculated by dividing intervals of participant engagement divided by the total amount of intervals, multiplied by 100.

Problem behaviour. Problem behaviour was defined as the participant engaging in any form of problem behaviour, including but not limited to non-compliance, defiance, inappropriate talking or yelling, and walking or running away from the group. During an assessment period, two 60-minute sessions were recorded. As with participant engagement, for each session, only the circuit-training portion was used for coding problem behaviour. For each participant, a 10-minute random sample was chosen for each observation session. The average of the 10-minute random samples from the two observation sessions was the score for that assessment period. A partial interval recording procedure was used with a 10 s interval. If problem behaviour occurred

during any point in an interval, it was recorded as an occurrence. If no problem behaviour occurred during an interval, it was recorded as a non-occurrence. For each 10-minute session sample that was observed, a percentage of intervals of problem behaviour was be calculated by dividing intervals with problem behaviour by the total number of intervals, multiplied by 100.

Physical fitness. Physical fitness measurements were gathered for all participants with autism. These measurements were conducted in the UBC Kinesiology lab with assistance from the fitness instructors. Physical fitness measurements included aerobic fitness, body mass index (BMI), flexibility, and muscular strength. These are defined below.

Aerobic fitness. Aerobic fitness was measured by using the sub-maximal, standardized aerobic 6-minute walk test (6MWT). The 6MWT is used to measure an individual's response to a physical activity intervention or physical rehabilitation and assesses each individual's functional exercise capacity. During this test the participant walked on a hard, flat surface without stopping for a period of 6 minutes, and the total distance travelled was recorded in metres (Bernard et. al., 2015).

Body Mass Index (BMI). BMI was measured by calculating the formula BMI = kg/m^2, where kg is the individual's weight in kilograms, and m^2 is the individual's height in metres squared. To measure weight, fitness instructors calibrated a beam scale to ensure accuracy. Participants removed their shoes and any heavy clothing, and then stood on the scale facing the beam. The fitness instructor adjusted the counter weight until the beam rested in a straight horizontal line to produce the final weight score in kg. To measure height, the participants also removed their shoes and stood with their feet flat together and their head, shoulders, back, buttocks, and heels against a wall, which was lined vertically with a measuring tape. The fitness

instructor directed the participants to look forward with their chin level to the ground and used a flat headpiece to form a right angle with the wall, resting on top of the crown of the head. The fitness instructor marked where the bottom of the headpiece met the wall to produce the final height score in metres. BMI is used to assess whether an individual is underweight, normal or healthy weight, overweight, or obese. BMI scores between 18.5 and 24.9 are considered to be a normal or healthy range, scores under 18.5 are considered to be underweight, scores between 25 and 29.9 are considered to be overweight, and scores over 30 are considered to be obese (Centers for Disease Control and Prevention, 2015). For participants with BMI scores at 25 or above, the goal was for them to decrease their weight toward the normal or healthy range. For participants with BMI scores in the normal or healthy 18.5 to 24.9 range, the goal was for them to maintain their weight within this range.

Flexibility. Flexibility was measured using a Sit-and-Reach (SR) test. To measure trunk forward flexion and hip, low back, and hamstring range of motion, participants sat in straight legged, shoes off, with their feet pressed up against a wooden box containing a mounted scale. Placing fingertips with hands overlapped and prone, the participant slowly reached forward as far as possible with head dropped down between the arms extended as far as possible. The distance reached was recorded and the process was repeated twice. The average of scores from the two trials produced the final measurement for flexibility (Thorndyke, 1995).

***Muscular strength*.** Muscular strength was measured by using a Hand Grip Strength test. The Hand Grip Strength test provides an objective measure of general upper body muscular strength. To measure Hand Grip Strength, the individual stood with their hands by their side with arms slightly bent. Holding a Hand Grip Strength dynamometer, the grip was taken between the fingers and the palm at the base of the thumb, adjusting the grip so the second joint of the fingers

fit snuggly under the handle and took the weight of the instrument. The dynamometer was held in line with the forearm, away from the thigh, away from the body. The participants were directed to breathe out and squeeze the dynamometer with as much force as possible. This was done twice for each hand, alternating sides after each measurement. Scores were recorded to the nearest kilogram, and the maximum score for each side was combined to produce the final muscular strength score.

Social measures. Social measures included interpersonal relationships and community involvement. These are described below.

Interpersonal relationships. The Social Network Analysis Interview Form (SNAF; Kennedy, Horner, & Newton, 1990) was used to measure interpersonal relationships by creating an index of an individual's interpersonal relationships to indicate which family members, friends, paid support workers, co-workers, and/or house mates were socially important to the individual. The SNAF was administered by interviewing the participant. If the participant was not able to accurately or reliably answer the SNAF questions, a parent or caregiver assisted in answering the questions along with the participant. The questions included in the SNAF interview inquired with whom the participant engaged in at least one activity in the last 30 days, how many activities they engaged in with each person, whether or not each person was socially significant to the participant, and how long the participant has known each person. Interpersonal relationship scores were determined by tallying the total number of people in which the participant engaged in at least one activity with in the last 30 days.

Community involvement. The Resident Lifestyle Inventory (RLI; Kennedy, Horner, Newton, & Kanda, 1990) was used to measure community involvement. The RLI is designed for

individuals with disabilities to determine which activities he or she has performed in the last 30 days, where and how often they were performed, which activities are most preferred, and evaluate levels of independence. The RLI lists 144 activities, and the participant's parents or caregiver who has interacted with the participant daily within the past six months ranked these activities in order of preference. The RLI was administered by interviewing each participant and his or her parent or caregiver. Community involvement scores were determined by tallying the total number of activities in which the participant engaged in the past 30 days.

Social validity. The social validity of the I CAN Get Fit program was measured by administering a questionnaire. The social validity questionnaire was delivered once at the end of the program, and was used to evaluate the acceptability and importance of the I CAN Get Fit program's goals, procedures, and outcomes (See Appendices D, E, and F). Questions were rated on a Likert-type scale from 1 to 5 (1 = low social validity, 5 = high social validity). Participants with autism, fitness instructors, and parents and caregivers were asked to complete separate questionnaires. For each evaluation, an average social validity rating across the total number of items was calculated and used as a summative rating of social validity.

Interobserver Agreement Procedures

A second observer was trained to observe and record videotaped occurrences of instructor implementation fidelity, participant engagement, and problem behaviour. The observer was blind to the purpose of the study and its phases. A random sample of video recordings was used for inter-observer agreement (IOA) training. The second observer was provided with a scoring manual containing operational definitions, examples and non-examples of the target behaviours, and a scoring protocol. During IOA training, both observers independently scored the data, and

then the results were compared until 90% IOA was scored across two consecutive trials. IOA sessions were held on 30% of observation sessions, balanced across baseline, post-intervention, and follow-up conditions. IOA sessions were randomly selected from each assessment period. Only data recorded by the primary observer was used for data analysis.

Percentage of total agreement for each measure was calculated by dividing the number of agreements by the total number of agreements and disagreements, multiplied by 100. The average IOA for instructor implementation fidelity was 87.9%. The average for participant engagement was 94.1% and the average for participant problem behaviour was 95.2%.

Research Design

This study employed a randomized control trial using an experimental group and waitlist control group to answer the experimental questions posed (See Figure 1). Fourteen individuals with autism and eight fitness instructors were randomly assigned to either the experimental or control group. There were three periods of assessment, Assessment I, II, and III, in which both the experimental and waitlist control groups followed an assessment protocol for a period of one week. At the start of the study (Assessment I), direct and indirect measurements occurred through baseline assessments for both groups. Following the first assessment, the intervention was implemented for the experimental group while the waitlist control group received no intervention. The intervention included a full-day instructor training session, followed by 12 sessions of physical fitness over a period of 6 weeks. After the end of the 6 weeks, assessments were repeated for both experimental and waitlist control groups (Assessment II). This assessment served as post-intervention assessment for the experimental group and a second baseline assessment for the waitlist control group. Intervention was then implemented for the waitlist

control group. After the 6-week program was completed for the waitlist control group, another week of assessments was conducted for both the experimental and waitlist control group. (Assessment III). This final assessment served as follow-up assessment for the experimental group and post-intervention assessment for the waitlist control group.

	Assessment I		Assessment II		Assessment III
Experimental Group	O	X	O		O
Waitlist Control Group	O		O	X	O

Figure 1. Randomized control trial research design represented in chronological order, in which O = observation and X = intervention (I CAN Get Fit program).

Analysis

Two statistical analyses were used to conduct within and between group comparisons. The Friedman Rank Sum Test was used to examine change across assessment periods for each group (i.e., Assessment I, II and III). If the Friedman test indicated that there was a statistically significant overall effect for a group across the three assessment periods, then a post-hoc analysis was conducted using the Nemenyi test (Pohlert, 2014). The post-hoc test identified which of the three pair-wise group mean differences were statistically significant (i.e., Assessments I and II, Assessments II and III, and/or Assessments I and III). The following formula was used within a computer-based program that conducted the test:

$$|\bar{R}_i - \bar{R}_j| > \frac{q_{\infty;k;\alpha}}{\sqrt{2}} \sqrt{\frac{k\,(k+1)}{6n}}$$

The Nemenyi post-hoc test was developed to account for *family-wise error*; that is, the probability of making a Type 1 error (i.e., false positive) when performing multiple tests. It thus

is already a conservative test. For this reason, there is no *p*-adjustment in the function above (Pohlert, 2014).

The Wilcoxon Rank Sum Test was used to examine change between groups at each of the three assessment periods. The Friedman and Wilcoxon Tests were used across each of the dependent measures, including instructor implementation of Positive Behaviour Support, participant engagement, problem behaviour, aerobic fitness, body mass index, flexibility strength, interpersonal relationships, and community involvement.

Procedures

Research procedures included baseline assessment, intervention, post-intervention assessment, and follow-up assessment. A flow chart (See Figure 2) is used to visually represent the flow of participants through each phase of the study and a table (See Figure 3) is used to display the timeline of research activities.

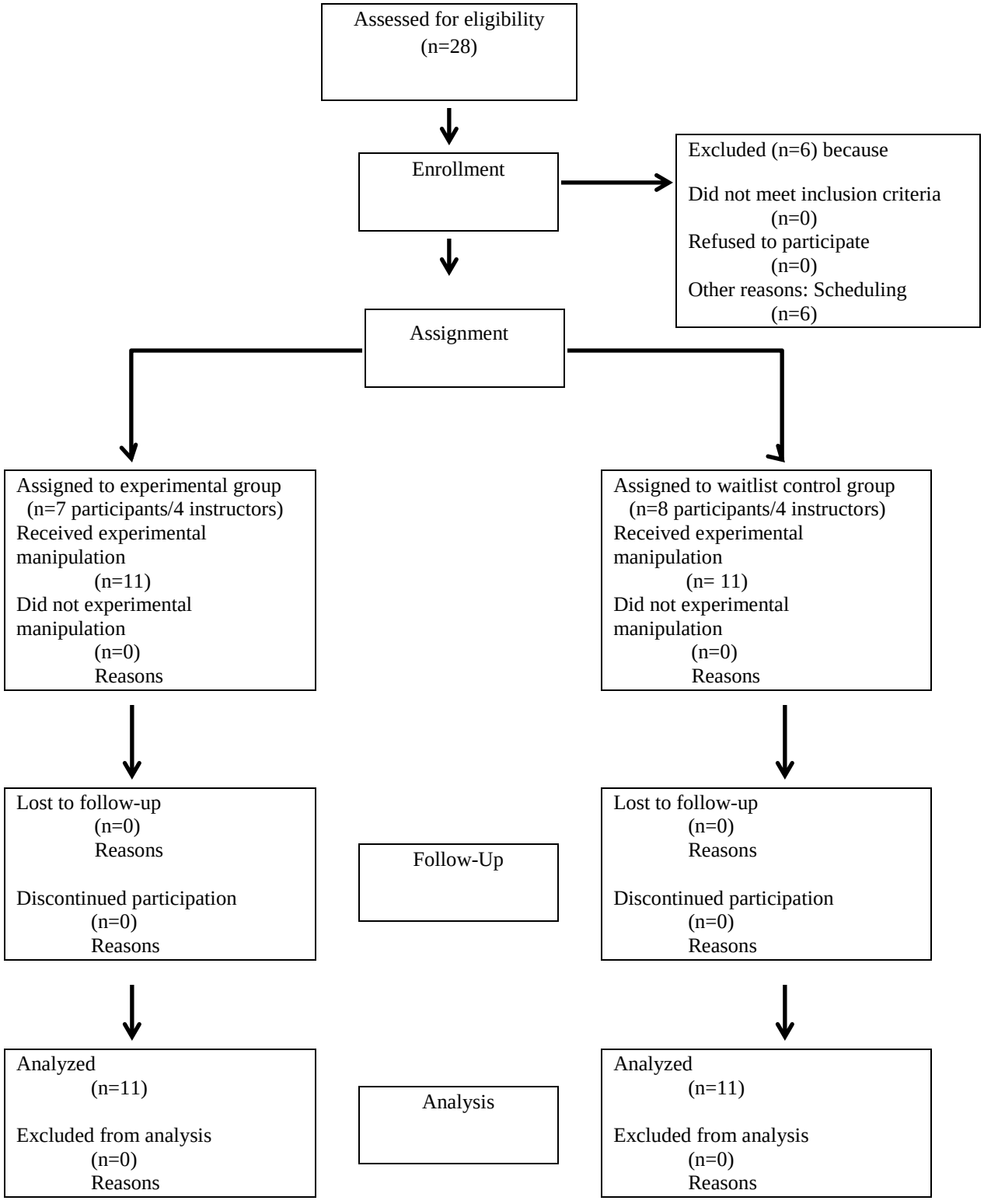

Figure 2. Flow of participants through each stage of randomized control trial.

Time	Experimental Group Research Activities	Waitlist Control Group Research Activities
Week 1	Assessment I: Baseline 1 Direct Measures: Structured Observations ▪ Implementation Fidelity ▪ Engagement ▪ Problem Behaviour ▪ Physical Health Indirect Measurement: Questionnaires ▪ Interpersonal Relationships ▪ Community Involvement	Assessment I: Baseline 1 Direct Measures: Structured Observations ▪ Implementation Fidelity ▪ Engagement ▪ Problem Behaviour ▪ Physical Health Indirect Measurement: Questionnaires ▪ Interpersonal Relationships ▪ Community Involvement
Weeks 2-7	Intervention: I CAN Get Fit Program: ▪ 4-hour Instructor Training ▪ Twelve, 1-hour fitness sessions ▪ In-vivo coaches training	Waiting Period: No activity.
Week 8	Assessment II: Post-Intervention Direct Measures: Structured Observations ▪ Implementation Fidelity ▪ Engagement ▪ Problem Behaviour ▪ Physical Health Indirect Measurement: Questionnaires ▪ Interpersonal Relationships ▪ Community Involvement	Assessment II: Baseline 2 Direct Measures: Structured Observations ▪ Implementation Fidelity ▪ Engagement ▪ Problem Behaviour ▪ Physical Health Indirect Measurement: Questionnaires ▪ Interpersonal Relationships ▪ Community Involvement
Weeks 9-14	Waiting Period: No activity.	Intervention: I CAN Get Fit Program: ▪ 4-hour Instructor Training ▪ Twelve, 1-hour fitness sessions ▪ In-vivo coaches training
Week 15	Assessment III: Follow-Up Direct Measures: Structured Observations ▪ Implementation Fidelity ▪ Engagement ▪ Problem Behaviour ▪ Physical Health Indirect Measurement: Questionnaires ▪ Interpersonal Relationships ▪ Community Involvement ▪ Social Validity	Assessment III: Post-Intervention Direct Measures: Structured Observations ▪ Implementation Fidelity ▪ Engagement ▪ Problem Behaviour ▪ Physical Health Indirect Measurement: Questionnaires ▪ Interpersonal Relationships ▪ Community Involvement ▪ Social Validity

Figure 3. Timeline of Activities

Assessment I:

Baseline assessments for the experimental group and waitlist control group occurred over the period of one week. Direct measurements took place during two structured observation sessions. Each structured observation session consisted of 60 minutes of physical fitness activity. The experimental and waitlist control groups participated in observations sessions separately. During the structured observation, the instructor identified as the "coach" of the class created a detailed lesson plan to be followed throughout the class, which had to include 3-5 warm up activities, 3 circuits, 3-5 cool down activities, and a stretch. Instructors were given no additional training during the observation session. During each observation session, direct measurement of instructor implementation fidelity, participant engagement, problem behaviour, and physical health (i.e., aerobic fitness, BMI, flexibility, and muscular strength) was gathered. Indirect measurement, including the RLI and SNAF, was gathered from participants and parents/care providers during the week that observations were conducted. Completion of each indirect measure occurred at a time that was convenient for participants and care providers before or after the physical fitness sessions. All direct and indirect measurements took place at the UBC BodyWorks facility.

Intervention – Experimental Group

The intervention was the implementation of the I CAN Get Fit program. This program included teaching instructors Positive Behaviour Support strategies, using BST, and the implementation of I CAN Get Fit lesson plans across 12 sessions, two per week for a period of 6 weeks.

In-class training session. After baseline assessments were completed, I provided instructors in the experimental group with a 4-hour, in-class training session. The training session included a review of the I CAN Get Fit lesson plans and schedules, instructor roles and responsibilities, and general facility safety protocols. As certified personal trainers, the instructors already had previous knowledge on how to safely teach these activities and physically adapt activities when needed. Instructors also learned about the common characteristics of autism, and what autism looks like in the community recreation setting. The focus of the remainder of the training session was to teach instructors how to implement PBS strategies. This involved the implementation of Behavioural Skills Training (BST) to teach Positive Behaviour Support strategies, in which each PBS strategy was taught using instruction, modeling, role-play, and feedback.

Positive Behaviour Support. I began the Positive Behaviour Support (PBS) training by providing an overview of PBS, how it relates to providing support to individuals with autism in the recreation setting, and how PBS approaches behaviour change using the concept of function of behaviour. Using instruction, modeling, coaching, feedback, and reinforcement (i.e., BST), I taught the instructors to use Positive Behaviour Support strategies intended to set the stage for success, prevent problem behaviour, teach positive behaviour, strengthen positive behaviour, and weaken problem behaviour. As BST was used for initial skill acquisition of PBS strategies, I also gave instructors a PBS checklist to use in programs to self-monitor their use of PBS strategies. Self-monitoring checklists have been shown to increase procedural integrity for staff implementation of behavioural interventions for individuals with developmental disabilities (Plavnik, Ferreri, & Maupin, 2010; Petscher & Bailey, 2006). In addition to self-monitoring the

use of PBS strategies, instructors also used the checklist to identify areas in which they may need more training, and request additional support throughout the program to increase their efficacy.

***In vivo* training and support.** Each week had two fitness sessions, the first in which I was present to provide the instructors with direct, *in vivo* training and support to the instructors. I was not present during the second class of the week to allow the instructors time to practice implementing the lessons and strategies on their own. During the sessions in which I was present, I observed instructor implementation of the lesson plans and Positive Behaviour Support strategies, and provided *in-vivo* training and support. *In vivo* training and support included providing immediate feedback, modeling strategies, and positive reinforcement for the use of PBS strategies with participants. The instructors also received weekly e-mails in which I provided lesson plans for the week, summarized feedback and reminders on how to best implement the strategies, and reiterated their goals for achieving items on the checklist of PBS strategies for the next session.

Implementation of I CAN Get Fit lessons. Following the in-class training session, the instructors implemented the I CAN Get Fit lessons with their group of seven individuals with autism. Participants attended twelve 1-hour classes, twice a week, at UBC BodyWorks.

Instructor to participant ratio. The staff to participant ratio for adolescent and young adult Canucks Autism Network programs is 1:2, including a coach who leads activities and manages time. This was the model for the I CAN Get Fit program. Participants in CAN programs consistently present a range of abilities and skills. This range generally results in a class balanced with participants who require low, moderate, and high levels of support. For this study, we ensured that each class was balanced in which half participants had a history of little to no

fproblem behaviour, requiring low levels of support, and half of the participants had mild to moderate problem behaviour, requiring moderate support. All participants demonstrated a range of intellectual, cognitive, or verbal levels. Instructors were paired with one participant with a history of little to no problem behaviour and one participant with mild to moderate problem behaviour. Participants were paired together as best as possible to have similar fitness levels.

Session structure. When participants entered, staff greeted the participants and led them to the class area. To begin each session, the coach led a brief group warm up. Each instructor stood next to their participants and assisted as needed. The group then split up into smaller groups of two to engage in circuit style activities for 40 minutes. Prior each circuit, an instructor explained and modeled the entire circuit before the participants began. Circuit style activities included 3-5 exercises that participants engaged in for 1-3 minutes, with a brief break in between each exercise. After all of the circuits were completed, the group reunited for a cool down activity and stretch led by the coach.

Assessment II:

During Assessment II, post-intervention assessment was conducted for the experimental group and a second baseline assessment was gathered for the waitlist control group. The experimental and waitlist control groups participated in two structured observations sessions separately. Assessment procedures were implemented as described in Assessment I on page 38.

Intervention – Waitlist Control Group

The intervention protocol, as implemented with the experimental group and described above on pages 38-41, was implemented for the waitlist control group. Instructors were provided

with the full day training session and ongoing *in vivo* training and support, and implemented the I CAN Get Fit lesson plans across the 12 sessions and 6-week period.

Assessment III:

During assessment III, follow-up assessment was gathered for the experimental group, and post-intervention assessment was gathered for the waitlist control group. As before, the experimental and waitlist control groups participated in two structured observations sessions separately. Assessment procedures were implemented as described in Assessment I on page 38.

End of session meeting. After the final assessment, parents and participants were invited to meet with the instructors briefly to discuss their participant's progress, as well view physical health assessment results. Families were provided with information for future programming at UBC BodyWorks and in other related programs the community. Finally, at the end of the meeting, participants were awarded with an "I CAN Get Fit" emblem, t-shirt, and certificate to acknowledge their completion of the I CAN Get Fit program.

CHAPTER 3: RESULTS

Results

Experimental and waitlist control groups were assessed three times to measure instructor implementation fidelity of Positive Behaviour Support, participant engagement, problem behaviour, physical fitness, and social measures. The analysis of the results included examining differences across time within each group, and differences between the experimental and waitlist control groups at each assessment period. The non-parametric Friedman Test was used to analyze statistically significant changes *within* groups. For Friedman tests that indicated statistically significant within group differences across the three assessment periods, post-hoc tests using the Nemenyi method served to identify the location of the statistically significant difference between all combinations of the three assessment periods. The post-hoc tests also served to reduce the occurrence of false positives (Type I errors) due to multiple comparisons across the three assessment periods. The non-parametric Wilcoxon Rank Sum Test was used to measure statistically significant differences *between* the experimental and waitlist control groups. Table 3 shows the means, standard deviations, W-scores, Z-scores, and *p*-values for each dependent variable analyzed using the Friedman Test. Table 3 also shows the chi square and *p*-values for each dependent variable analyzed using the Wilcoxon Rank Sum Test.

Table 3

Friedman Rank Sum Test Means, Standard Deviation, W, Z, p-values Within Groups, and Wilcoxon Rank Test Chi-squared and p-values Between Groups For Nine Dependent Variables For Experimental and Waitlist Control Groups.

	Assessment I						Assessment II						Assessment III						Within Group	
Variable	M	Med	SD	W	Z	*p*	M	Med	SD	W	Z	*p*	M	Med	SD	W	Z	*p*	χ^2	*p*
Instructor PBS																				
Experimental	15.63	15	3.95	18	0	1	84.38	85	3.15	10	-2.309	.02	90.20	90.25	4.71	15.5	-.72	.47	6.53	.038
Control	14	14	2.31				15.75	13.75	8.4				87.88	86.25	8.97				6	.05
Engagement																				
Experimental	69	76	32.72	51	-.19	.85	97	99	4.52	31.5	-2.68	.007	98.58	100	2.24	52	-.06	.95	8.72	.01
Control	72	73	34.03				72	81.5	32.74				98.71	100	1.68				7.15	.02
PB																				
Experimental	26.14	14	34.64	49	-.44	.66	2.07	1	3.78	30	-2.88	0.004	0.5	0	0.96	50	-.32	.75	11.27	.004
Control	21.86	12	34.96				27.86	17	32.98				0.5	0	0.65				10.23	.006
Aerobic Fitness																				
Experimental	402	420	76.97	49.5	-.38	.701	400	360	76.6	41	-1.47	.14	463	460	63.7	45.5	-.89	.37	2.64	.27
Control	443	420	87.51				460	500	79.16				524	460	117.5				6.89	.03
BMI																				
Experimental	26.92	23	10.38	51	-.19	.85	26.56	22.7	10.26	52	-0.064	.95	26.83	22.5	9.71	22.5	-.26	.8	3.71	.16
Control	24.13	24.9	4.16	51			23.67	25.4	3.87				23.54	25.3	3.9				3.5	.17
Flexibility																				
Experimental	28.43	23	17.37	52	-.06	.95	37.71	38	10.21	43.5	-1.15	.25	33.29	28	11.22	51.5	-.13	.9	0.86	.65
Control	26.71	26	11.74				31	33	9.34				32.57	34	9.78		-0.128	0.9	2.79	.25
Muscular Strength																				
Experimental	62.08	65	9.83	48	-.58	.57	77.28	76	6.24	49.5	-0.383	.70	62.71	46	35.41	44.5	-1.022	.31	6.74	.03
Control	59.23	56	13.5			0.57	72	77	20.61			0.701	71.14	82	22.3				3.5	.17
IR																				
Experimental	12.43	12	9.48	48	-.58	.57	24.43	20	11.18	33.5	-2.428	.02	14.29	11	12.91	41	-1.469	.14	8.07	.02
Control	17.43	15	16.64	48	-0.58	0.57	10.14	9	9.26	33.5	-2.428	0.015	19.86	17	6.67	41	-1.469		9.31	.01
CI																				
Experimental	40.71	40	11.87	49	-.45	.66	42.14	35	20.08	46.5	-0.767	.44	32.71	29	14.47	47.5	-.64	.52	6	.05
Control	45	47	17.26	49	-0.45	0.66	33.57	33	19.13	46.5	-0.767	0.443	39.58	34	21.24	47.5			9.54	.0001

Note. PB = Problem Behaviour; BMI = Body Mass Index; IR = Interpersonal Relationships; CI = Community Involvement

Instructor Implementation Fidelity of Positive Behaviour Support

Table 3 summarizes instructor implementation fidelity of Positive Behaviour Support strategies for experimental and waitlist control groups across the three assessment periods (see Table 3). Figure 4 shows the average percentage of correctly implemented instructor Positive Behaviour Support strategies for experimental and waitlist control groups.

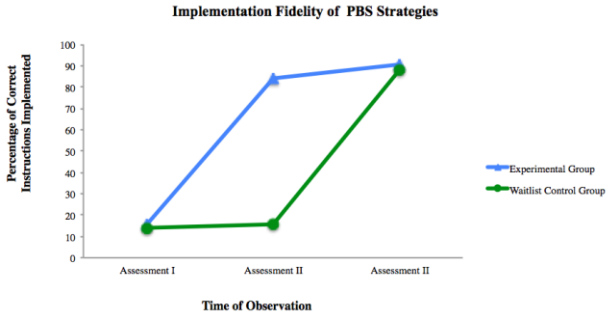

Figure 4. Average percentage of instructor implementation of Positive Behaviour Support.

Change across assessment periods. The Friedman Rank Sum Test showed a statistically significant change in instructor implementation of PBS strategies for the experimental group across Assessment I (Baseline 1; M = 15.63% of strategies; SD = 3.95), Assessment II (Post-intervention, M = 84.38% of strategies, SD = 3.15), and Assessment III (Follow-up; M = 90.38% of strategies; SD = 4.71), $\chi^2 = 6.53$, $p = .04$). Post-hoc tests of all possible pairs of assessment periods (i.e., Assessment I and II; Assessment I and III; and Assessment II and III) showed that a statistically significant improvement occurred between Assessment I and II ($p = .05$); that is, between Baseline 1 and Post-intervention assessments.

The Friedman Rank Sum Test also showed a statistically significant change in instructor implementation fidelity of PBS strategies for the waitlist control group across Assessment I (Baseline 1; M = 14% of strategies; SD = 2.31), Assessment II (Baseline 2, M = 15.75% of strategies, SD = 8.4), and Assessment III (Post-intervention; M = 87.88% of strategies; SD =

8.97), $\chi^2 = 6$, $p = .05$). Post-hoc tests of all possible pairs of assessment periods showed that a statistically significant improvement in instructor implementation fidelity occurred between Assessment II and III ($p = .05$); that is, between Baseline 2 and Post-intervention assessments.

Change between groups. The Wilcoxon Rank Sum Test showed no statistically significant difference between the experimental group (Baseline 1) and waitlist control group (Baseline 1) at Assessment I (W = 18, Z = 0, $p = 1$), with both groups showing low levels of implementation fidelity of PBS strategies (M = 15.63% for experimental group, and 14% for the waitlist control group). A statistically significant difference was demonstrated between the experimental (Post-intervention) and waitlist groups (Baseline 2) at Assessment II (W = 10, Z = -2.31, $p = .02$), with the experimental group showing a marked improvement in implementation fidelity of PBS strategies (M = 84.38%), and the waitlist control group showing little to no improvement (M = 15.75%). Finally, there was no statistically significant different between the experimental group (Follow-up) and waitlist control group (Post-intervention) at Assessment III (W = 15.5, Z = -.72, $p = .26$), with both groups showing similar high levels of implementation fidelity (M = 90.38% for the experimental group, and 87.88% for the waitlist control group).

Participant Behaviour

Figure 5 shows the average participant engagement and problem behaviour scores across assessment periods for the experimental and waitlist control groups.

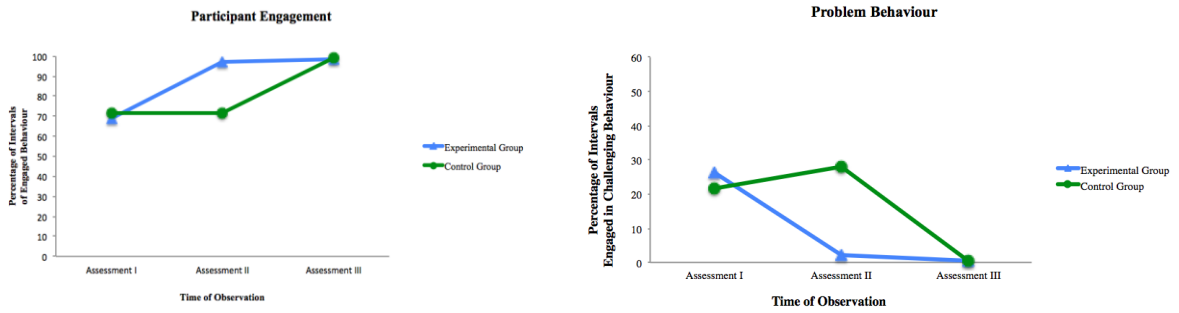

Figure 5. Average percentage of participant engagement and problem behaviour.

Participant engagement. Table 3 summarizes participant engagement for experimental and waitlist control groups across the three assessment periods. Figure 5 shows the average percentage of intervals with participant engagement for experimental and waitlist control groups.

Change across assessment periods. The Friedman Rank Sum Test showed a statistically significant change in participant engagement for the experimental group across Assessment I (Baseline 1; M = 69% engagement; SD = 32.72), Assessment II (Post-intervention, M = 97% engagement, SD = 4.52), and Assessment III (Follow-up; M = 98.57% engagement; SD = 2.29), $\chi^2 = 8.72$, $p = .01$). Post-hoc tests of all possible pairs of assessment periods (i.e., Assessment I and II; Assessment I and III; and Assessment II and III) showed that a statistically significant improvement in participant engagement occurred between Assessment I and II ($p = .03$); that is, between Baseline 1 and Post-intervention assessments.

The Friedman Rank Sum Test also showed a statistically significant change in participant engagement for the waitlist control group across Assessment I (Baseline 1; M = 71.71% engagement; SD = 34.03), Assessment II (Baseline 2, M = 71.71% engagement, SD = 34.03), and Assessment III (Post-intervention; M = 98.71% engagement; SD = 1.68), $\chi^2 = 7.15$, $p = .03$). Post-hoc tests of all possible pairs of assessment periods showed that a statistically significant

improvement in participant engagement occurred between Assessment II and III (p = .04); that is, between Baseline 2 and Post-intervention assessments.

Change between groups. The Wilcoxon Rank Sum Test showed no statistically significant difference between the experimental group (Baseline 1) and waitlist control group (Baseline 1) at Assessment I (W = 51, Z = -.19, p = .85), with both groups showing a moderate level of engagement (M = 69% for experimental group, and M = 71.71% for waitlist control group). A statistically significant difference was demonstrated between the experimental group (Post-intervention) and waitlist group (Baseline 2) at Assessment II (W = 31.5, Z = -2.68, p = .007), with the experimental group showing a marked improvement in engagement (M = 97%), and the waitlist control group showing no improvement (M = 71.71%). Finally, there was no statistically significant different between the experimental group (Follow-up) and waitlist control group (Post-intervention) at Assessment III (W = 52, Z = -.06, p = .95), with both groups showing similar high levels of engagement (M = 98.57% for experimental group, and M = 98.71% for waitlist control group).

Problem behaviour. Table 3 summarizes participant problem behaviour for experimental and waitlist control groups across the three assessment periods. Figure 5 shows the average percentage of intervals with participant problem behaviour for experimental and waitlist control groups.

Change across assessment periods. The Friedman Rank Sum Test showed a statistically significant change in problem behaviour for the experimental group across Assessment I (Baseline 1; M = 26.14% problem behaviour; SD = 34.64), Assessment II (Post-intervention, M = 2.07% problem behaviour, SD = 3.78), and Assessment III (Follow-up; M = 0.5% problem behaviour; SD = .96), χ^2 = 11.3, p = .004). Post-hoc tests of all possible pairs of assessment

periods showed that a statistically significant decrease in problem behaviour occurred between Assessment I and II (p = .02); that is, between Baseline 1 and Post-intervention assessments.

The Friedman Rank Sum Test also showed a statistically significant change in problem behaviour for the waitlist control group across Assessment I (Baseline 1; M = 21.86% problem behaviour; SD = 34.96), Assessment II (Baseline 2, M = 27.86% problem behaviour, SD = 32.98), and Assessment III (Post-intervention; M = .5% problem behaviour; SD = .65), χ^2 = 10.2, p = .01). Post-hoc tests of all possible pairs of assessment periods showed that a statistically significant decrease in problem behaviour occurred between Assessment II and III (p = .008); that is, between Baseline 2 and Post-intervention assessments.

Change between groups. The Wilcoxon Rank Sum Test showed no statistically significant difference between the experimental group (Baseline 1) and waitlist control group (Baseline 1) at Assessment I (W = 49, Z = -.45, p = .66), with both groups showing moderate levels of problem behaviour (M = 26.14% for experimental group, and 21.86% for waitlist control group). A statistically significant difference was demonstrated between the experimental group (Post-intervention) and waitlist group (Baseline 2) at Assessment II (W = 30, Z = -2.98, p = .004), with the experimental group showing a marked decrease in problem behavior (M = 2.07%) and the waitlist control group showing a moderate increase in problem behavior (M = 27.86%). Finally, there was no statistically significant difference between the experimental group (Follow-up) and waitlist control group (Post-intervention) at Assessment III (W = 50, Z = -.32, p = .75), with both groups showing near zero levels of problem behaviour (M = 0.5% for both experimental and waitlist control groups).

Physical Fitness Measures

Physical fitness measures included instructor aerobic fitness, body mass index, flexibility,

and muscular strength. Figure 6 shows the average participant physical fitness scores across the three assessment periods for the experimental and waitlist control groups.

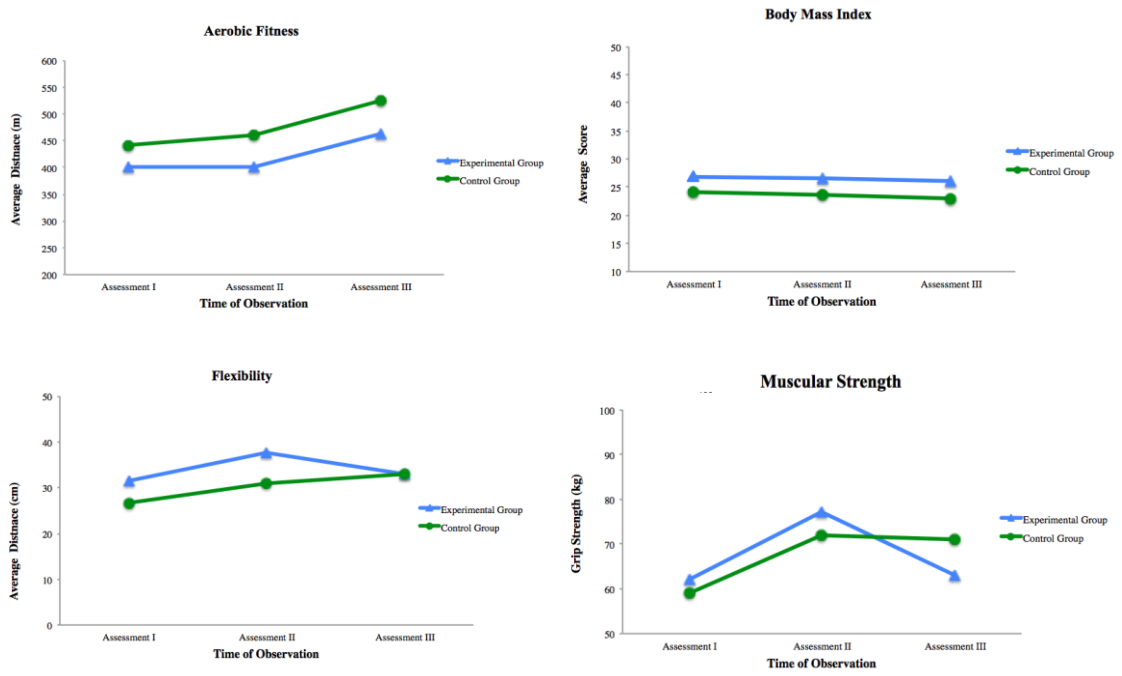

Figure 6. Average participant aerobic fitness, body mass index, flexibility and muscular strength scores for the experimental and waitlist control group.

Aerobic fitness. Table 3 summarizes participant aerobic endurance for experimental and waitlist control groups across the three assessment periods. Figure 6 shows the average aerobic fitness scores for experimental and waitlist control groups.

Change across assessment periods. The Friedman Rank Sum Test showed no statistically significant change in aerobic fitness for the experimental group across Assessment I (Baseline 1; M = 402 m; SD = 76.97), Assessment II (Post-intervention, M = 400 m, SD = 76.6), and Assessment III (Follow-up; M = 463 m; SD = 63.7), $\chi^2 = 2.64$, $p = .27$). The Friedman Rank Sum Test indicated a statistically significant change in aerobic fitness for the waitlist control group across Assessment I (Baseline 1; M = 443 m; SD = 87.51), Assessment II (Baseline 2, M = 460 m, SD = 76.16), and Assessment III (Post-intervention; M = 524 m; SD = 117.5), $\chi^2 = 6.89$,

p = .03). However, post-hoc tests of all possible pairs of assessment periods showed that there was no statistically significant change in aerobic fitness between assessments.

Change between groups. The Wilcoxon Rank Sum Test showed no statistically significant difference in aerobic fitness between the experimental group (Baseline 1) and waitlist control group (Baseline 1) at Assessment I (W = 49.5, Z = -.38, p = .7). No statistically significant difference in aerobic fitness was demonstrated between the experimental group (Post-intervention) and waitlist group (Baseline 2) at Assessment II (W = 41, Z = -1.47, p = .14). Finally, there was no statistically significant difference in aerobic fitness between the experimental group (Follow-up) and waitlist control group (Post-intervention) at Assessment III (W = 45.5, Z = -.89, p = .37).

Body mass index (BMI). Table 3 summarizes participant body mass index for experimental and waitlist control groups across the three assessment periods. Figure 6 shows the average body mass index scores for experimental and waitlist control groups.

Change across assessment periods. The Friedman Rank Sum Test showed no statistically significant change in BMI for the experimental group across Assessment I (Baseline 1; M = 26.92 BMI; SD = 10.83), Assessment II (Post-intervention, M = 26.56 BMI, SD = 10.26), and Assessment III (Follow-up; M = 26.83 BMI; SD = 9.71), χ^2 =3.71, p = .16).
The Friedman Rank Sum Test also showed no statistically significant change in BMI for the waitlist control group across Assessment I (Baseline 1; M = 24.13 BMI; SD = 4.16), Assessment II (Baseline 2, M = 23.67 BMI, SD = 3.87), and Assessment III (Post-intervention; M = 23.54 BMI; SD = 3.9), χ^2 = 3.5, p = .17).

Change between groups. The Wilcoxon Rank Sum Test showed no statistically significant difference in BMI between the experimental group (Baseline 1) and waitlist control

group (Baseline 1) at Assessment I (W = 51, Z = -.19, p = .85). No statistically significant difference in BMI was demonstrated between the experimental group (Post-intervention) and waitlist group (Baseline 2) at Assessment II (W = 52, Z = -.06, p = .95). Finally, there was no statistically significant difference in BMI between the experimental group (Follow-up) and waitlist control group (Post-intervention) at Assessment III (W = 22.5, Z = -.26, p = .8).

Flexibility. Table 3 summarizes participant flexibility for experimental and waitlist control groups across the three assessment periods. Figure 6 shows the average flexibility scores for experimental group and waitlist control group.

Change across assessment periods. The Friedman Rank Sum Test showed no statistically significant change in flexibility for the experimental group across Assessment I (Baseline 1; M = 28.43 cm; SD = 17.37), Assessment II (Post-intervention, M = 37.71 cm, SD = 10.21), and Assessment III (Follow-up; M = 33.29 cm; SD = 11.22), χ^2 = .86, p = .65). The Friedman Rank Sum Test also showed no statistically significant change in flexibility for the waitlist control group across Assessment I (Baseline 1; M = 26.71 cm; SD = 11.74), Assessment II (Baseline 2, M = 31 cm, SD = 9.34), and Assessment III (Post-intervention; M = 32.57 cm; SD = 9.78), χ^2 = 2.79, p = .25).

Change between groups. The Wilcoxon Rank Sum Test showed no statistically significant difference in flexibility between the experimental group (Baseline 1) and waitlist control group (Baseline 1) at Assessment I (W = 52, Z = -.06, p = .95). No statistically significant difference in flexibility was evidenced between the experimental group (Post-intervention) and waitlist group (Baseline 2) at Assessment II (W = 43.5, Z = -1.15, p = .25). Finally, there was no statistically significant difference in flexibility between the experimental

group (Follow-up) and waitlist control group (Post-intervention) at Assessment III (W = 51.5, Z = -.13, p = .9).

Muscular strength. Table 3 summarizes participant muscular strength for experimental and waitlist control groups across the three assessment periods. Figure 6 shows the average muscular strength scores for experimental and waitlist control groups.

Change across assessment periods. The Friedman Rank Sum Test indicated a statistically significant change in muscular strength for the experimental group across Assessment I (Baseline 1; M = 62.08 kg; SD = 9.83), Assessment II (Post-intervention, M = 77.28 kg, SD = N), and Assessment III (Follow-up; M = 62.71 kg; SD = .35.41), χ^2 = 6.74, p = .03). However, post-hoc tests of all possible pairs of assessment periods showed that there was no statistically significant change in muscular strength between assessments. The Friedman Rank Sum Test showed no statistically significant change in muscular strength for the waitlist control group across Assessment I (Baseline 1; M = 59.23 kg; SD = 13.5), Assessment II (Baseline 2, M = 72 kg, SD = 20.61), and Assessment III (Post-intervention; M = 71.14 kg; SD = 22.3), χ^2 = 3.5, p = .17).

Change between groups. The Wilcoxon Rank Sum Test showed no statistically significant difference in muscular strength between the experimental group (Baseline 1) and waitlist control group (Baseline 1) at Assessment I (W = 48, Z = -.58, p = .57). No statistically significant difference in muscular strength was evidenced between the experimental (Post-intervention) and waitlist groups (Baseline 2) at Assessment II (W = 49.5, Z = -.38, p = .7). Finally, there was no statistically significant difference between the experimental group (Follow-up) and waitlist control group (Post-intervention) at Assessment III (W = 44.5, Z = -1.02, p = .31).

Social Measures

Figure 7 shows the average interpersonal relationship scores and community involvement scores across assessment periods for the experimental and waitlist control groups.

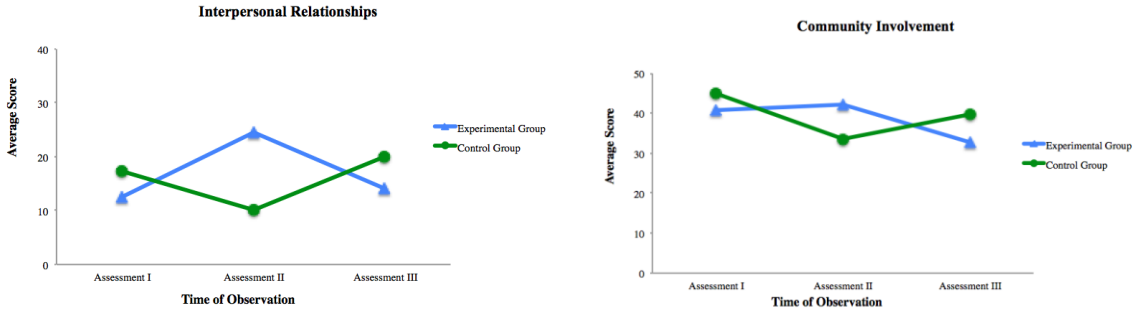

Figure 7. Average participant interpersonal relationships and community involvement scores for the experimental and waitlist control group.

Interpersonal relationships. Table 3 summarizes average interpersonal relationship scores for experimental and waitlist control groups across the three assessment periods. Figure 7 shows the average interpersonal relationship scores for experimental and waitlist control groups.

Change across assessment periods. The Friedman Rank Sum Test showed a statistically significant change in interpersonal relationships for the experimental group across Assessment I (Baseline 1; M = 12.43; SD = 9.48), Assessment II (Post-intervention, M = 24.43, SD = 11.18), and Assessment III (Follow-up; M = 14.29; SD = 12.91), $\chi^2 = 8.07$, $p = .02$). Post-hoc tests of all possible pairs of assessment periods showed that a statistically significant improvement in interpersonal relationships occurred between Assessment I and II ($p = .03$); that is, between Baseline 1 and Post-intervention.

The Friedman Rank Sum Test also showed a statistically significant change in interpersonal relationships for the waitlist control group across Assessment I (Baseline 1; M = 17.43; SD = 16.64), Assessment II (Baseline 2, M = 10.14, SD = 9.26), and Assessment III (Post-intervention; M = 19.86; SD = 6.67), $\chi^2 = 9.31$, $p = .01$). Post-hoc tests of all possible pairs

of assessment periods showed that a statistically significant improvement in interpersonal relationships occurred between Assessment II and III (p = .009); that is, between Baseline 2 and Post-intervention.

Change between groups. The Wilcoxon Rank Sum Test showed no statistically significant difference in interpersonal relationships between the experimental group (Baseline 1) and waitlist control group (Baseline 1) at Assessment I (W = 48, Z = -0.56, p = .56). A statistically significant difference in interpersonal relationships was demonstrated between the experimental (Post-intervention) and waitlist groups (Baseline 2) at Assessment II (W = 33.5, Z = -2.47, p = .02), with the experimental group showing a marked increase in interpersonal relationships (M = 24.43) and the waitlist control group showing a marked decrease in interpersonal relationships (M = 10.14). Finally, there was no statistically significant difference in interpersonal relationships between the experimental group (Follow-up) and waitlist control group (Post-intervention) at Assessment III (W = 41, Z = -1.47, p = .14).

Community involvement. Table 3 summarizes average community involvement scores for experimental and waitlist control groups across the three assessment periods. Figure 7 shows the average community involvement scores for experimental and waitlist control groups.

Change across assessment periods. The Friedman Rank Sum Test indicated a statistically significant change in community involvement for the experimental group across Assessment I (Baseline 1; M = 40.71; SD = 11.87), Assessment II (Post-intervention, M = 42.14, SD = 20.08), and Assessment III (Follow-up; M = 32.71; SD = 14.47), χ^2 = 6, p = .05). However, post-hoc tests of all possible pairs of assessment periods showed that there was no statistically significant change in community involvement between assessments.

The Friedman Rank Sum Test also showed a statistically significant change in community involvement for the waitlist control group across Assessment I (Baseline 1; M = 45; SD = 17.26), Assessment II (Baseline 2, M = 33.57, SD = 19.13), and Assessment III (Post-intervention; M = 39.58; SD = 21.24), $\chi^2 = 9.54$, $p = .0001$). Post-hoc tests of all possible pairs of assessment periods showed that a statistically significant decrease in community involvement occurred between Assessment I and II ($p = .0009$); that is, between the first and second baseline.

Change between groups. The Wilcoxon Rank Sum Test showed no statistically significant difference in community involvement between the experimental group (Baseline 1) and waitlist control group (Baseline 1) at Assessment I (W = 49, Z = -0.45, $p = .66$). No statistically significant difference in community involvement was evidenced between the experimental (Post-intervention) and waitlist groups (Baseline 2) at Assessment II (W = 46.5, Z = -.77, $p = .44$). Finally, there was no statistically significant difference in community involvement between the experimental group (Follow-up) and waitlist control group (Post-intervention) at Assessment III (W = 47.5, Z = -0.64, $p = .52$).

Descriptive Analysis

In addition to group comparison analyses, I also analyzed the individual scores of fitness instructors and fitness program participants across each dependent variable. Table 4 shows individual instructor implementation fidelity scores for the experimental group and waitlist control group. During baseline, instructors in both groups implemented an average of two PBS strategies out of a possible fourteen strategies. The most commonly used strategies in baseline were proactively prompting physical skills and safety signals. During post-intervention and follow-up assessments, instructors in both groups used an average of 11 PBS strategies out of a possible fourteen strategies. There were four strategies that were used infrequently by instructors

in both groups. These were: (a) proactively prompting communicative language; (b) proactively prompting peer interaction; (c) ignoring and redirecting problem behaviour; and (d) redirecting the participant to ask for a break or help.

Table 4

Individual Instructor Implementation Fidelity of PBS Scores Across Each Assessment Period

	Instructor Implementation Fidelity of PBS		
Group	Assessment I	Assessment II	Assessment III
Experimental			
1	15%	80%	96%
2	11.5%	85%	92%
3	15%	85%	85%
4	21%	87.5%	88.5%
Waitlist			
1	12%	8%	84%
2	12%	15.5%	88.5%
3	16%	27.5%	100%
4	16%	12%	79%

Table 5 shows individual participant scores for engagement, problem behaviour, physical fitness, interpersonal relationships and community involvement. During baseline, as expected, the 6 participants with a history of little to no problem behaviour demonstrated high levels of engagement and low levels of problem behaviour, while the 8 participants with a history of mild to moderate problem behaviour demonstrated lower levels of engagement and higher levels of problem behaviour. Types of problem behaviour observed among participants were non-compliance, elopement, speaking at inappropriate times or about inappropriate or off-topic subjects, and using equipment that was not allowed. At post-intervention, as expected, the 8 participants with a history of mild to moderate problem behavior evidenced improvements to high levels of engagement and low levels of problem behaviour. Also as expected at post-

intervention, the 6 participants with a history of little to no problem behaviour evidenced continued high levels of engagement and low levels of problem behaviour, or additional improvement to near zero levels of problem behaviour.

Table 5

Individual Participants Scores for Eight Dependent Variables

	Engagement			Problem Behaviour			Aerobic Fitness			BMI			Flexibility			MS			IR			CI		
Group	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
Experimental																								
1	73	100	100	13.5	0	0	320	360	460	32	31	32	13	22	25	42	79	62	24	48	39	43	54	47
2	0	87.5	97.5	100	10.5	2.5	500	340	440	22	21	23	22	37	28	67	82	81	0	19	11	36	26	29
3	62	96	100	32	1.5	0	460	360	480	20	21	21	23	38	21	65	74	74	8	18	3	40	33	24
4	76	99	94	26	1	0	420	340	520	18	18	19	57	49	52	67	76	46	14	20	24	42	35	20
5	96	100	100	0	0	0	420	520	560	23	23	21	27	28	26	73	88	96	12	23	8	63	50	50
6	95	100	100	1.5	0	0	420	500	400	25	24	25	47	40	41	62	72	37	25	28	11	37	78	45
7	81	96.5	98.5	10	1.5	1	280	380	380	48	48	47	10	50	40	59	70	43	4	15	4	24	19	14
Waitlist																								
1	71	75	100	18	17	0	420	400	420	28	27	28	19	37	28	80	101	90	54	11	17	29	16	29
2	73	72.5	96	8	27.5	1	360	400	460	25	25	25	39	28	36	44	48	35	15	9	20	56	36	49
3	0	0	100	100	100	0	440	340	460	28	27	27	40	33	34	55	43	43	16	0	16	32	28	32
4	71.5	85	97.5	11.5	15	1.5	480	500	660	18	18	18	12	12	14	56	70	80	9	28	34	74	68	82
5	100	91.5	100	0	7	0	400	540	560	22	21	21	15	30	32	44	77	82	6	2	14	26	10	15
6	100	81.5	97.5	3.5	25	1	380	500	410	28	28	27	36	38	45	71	87	83	15	14	21	47	33	36
7	85.5	96.5	100	12	3.5	0	620	540	700	20	20	19	26	39	39	64	78	85	7	7	17	51	44	34

Note. BMI = Body Mass Index; MS = Muscular Strength; IR = Interpersonal Relationships; CI = Community Involvement

Unshaded lines = Individuals with mild to moderate problem behaviour; Shaded lines = Individuals with little to no problem behaviour

In terms of physical fitness, social relationships and community involvement, there were little to no differences between the scores of participants with a history of little to no problem behaviour and participants with a history of mild to moderate problem behaviour. While average improvements in BMI were not statistically significant at post-intervention, individual data for five of the participants who were considered to be overweight or obese showed a reduction in BMI by one point at post-intervention. In addition, although average improvements in aerobic fitness, flexibility, and muscle strength were not statistically significant, individual data showed that 9 or 10 of the 14 participants evidenced improvements in aerobic fitness, flexibility, and muscle strength at post-intervention. However, follow-up measurement with the experimental group showed that only 3 or 4 of the 7 participants in the experimental group maintained these improvements.

Regarding interpersonal relationships, individual data showed improvements for all 14 participants at post-intervention but these gains maintained for only 3 of 7 participants in the experimental group at follow-up (i.e., Assessment III). Regarding community involvement, individual data showed that only 3 of 14 participants increased their community involvement at post-intervention. Of the 3 participants in the experimental group that showed improvement, 2 maintained these improvements at follow-up when compared to the first baseline. In contrast, 5 of the 7 participants in the experimental group showed a decrease in community involvement at post-intervention, while 6 of 7 participants in the waitlist control group showed either a decrease or no change in community involvement at post-intervention when compared to the first baseline.

Social Validity

Table 6 summarizes the mean, range, and grand mean of social validity ratings for participants, parents, and instructors in the experimental group and waitlist control group during post-intervention measurement for both groups. For the experimental group, average mean ratings of the social validity (i.e., the importance and acceptability of goals, procedures and outcomes) of the I CAN Get Fit program (*1 – strongly disagree; 5 = strongly agree*) were 4.3 for participants, 4.6 for parents, and 4.8 for instructors. For the waitlist control group, average mean ratings of social validity closely matched those of the experimental group, with ratings of 4.6 for participants, 4.6 for parents, and 4.9 for instructors. The grand average across all participants was 4.6 for the experimental group and 4.7 for the waitlist control group.

Table 6

Mean, Range, and Grand Mean Scores for Social Validity Questionnaires

	Participant		Parent		Instructor		
	M	R	M	R	M	R	GM
Group 1	4.3	(2.8-5.0)	4.6	(3.8-5.0)	4.8	(4.5-5.0)	4.6
Group 2	4.6	(3.7-5.0)	4.6	(4.2-5.0)	4.9	(4.9-5.0)	4.7

Note. M = Mean; R = Range; GM = Grand Mean

CHAPTER 4: DISCUSSION

Discussion

This study employed a randomized control trial across experimental and waitlist control conditions and three assessment periods to investigate the following research questions about the effectiveness and acceptability of the I CAN Get Fit program: (a) did the use of behavioral skills training (BST) increase certified fitness instructors use of PBS strategies with a group of adolescents and young adults with autism participating in the I CAN Get Fit program, including individuals with a history of moderate problem behaviour; (b) did infusing the group fitness program with PBS improve participant engagement and problem behaviour for adolescents and young adults with autism; (c) did participation in the group fitness program, infused with PBS, improve the physical fitness of participating adolescents and young adults with autism; (d) did participation in the group fitness program, infused with PBS, improve the interpersonal relationships and community involvement of participating adolescents and young adults with autism; and (e) did participants, instructors, and parents view the I CAN Get Fit program as socially valid.

In regard to instructor implementation fidelity, the results of the randomized control trial provide strong evidence that behavioral skills training (BST) was effective at teaching certified fitness instructors to implement PBS strategies with a high level of fidelity. Dramatic increases in implementation fidelity by fitness instructors occurred for both groups only in post-intervention and follow-up assessments. The instructors in the experimental group increased implementation fidelity of PBS strategies by 69% from baseline to post-intervention (from M = 15.6% to M = 85%). Instructors further increased implementation fidelity by 5.4% during

follow-up (M = 90.4%). Instructors in the waitlist control group demonstrated consistently low implementation fidelity of PBS strategies in the first and second baselines (M = 14% and 15.8%, respectively), but showed a 72.1% increase at post-intervention (from M = 15.8 to M = 87.9%). When comparing the experimental group with the waitlist control group across each assessment period, statistically significant differences in PBS strategy use by fitness instructors only occurred when the experimental group received the intervention while the waitlist control group remained in baseline conditions (M = 85% for experimental group, and M = 15.8% for waitlist control group during Assessment II). Evidence of an association between the I CAN Get Fit program and maintenance of implementation fidelity of PBS by fitness instructors in the experimental group can be seen in the modest but non-significant increase in implementation fidelity during follow-up. The descriptive analysis of individual instructor implementation fidelity data showed that ten out of the fourteen PBS strategies were used frequently by the instructors, and four strategies were not used as often. Because 11 of 14 participants had good communication skills (i.e., the ability to speak in full sentences), proactively prompting communicative language may have been less necessary and therefore not used as often by instructors. Since accurate implementation of the preventive, teaching, and positive reinforcement strategies most likely contributed to the reduction in participant problem behaviour, there were few opportunities for instructors to implement the two consequence strategies for problem behavior. As a result, only half of the instructors used the consequence strategy, ignore and redirect problem behavior; and none of the instructors used the consequence strategy, redirecting the participant to ask for a break or help.

In regard to participant engagement and problem behaviour, the results of the randomized control trial showed that infusing the group fitness program with PBS improved the engagement

and problem behaviour of the adolescents and young adults with autism. Improvements in participant engagement and problem behaviour occurred for both groups only in post-intervention and follow-up assessments. Participants in the experimental group increased engagement by 28% from baseline to post-intervention (from M = 69% to M = 97%), and engagement remained high in follow-up (M = 98.6%). Problem behaviour in the experimental group decreased by 23% from baseline to post-intervention (from M = 26.3% to M = 3.3%), and further decreased to near zero levels during follow-up (M = 1%). The participants in the waitlist control group demonstrated a consistently moderate level of engagement in the first and second baselines (M = 71.6% and 71.7%, respectively), but showed a 21.1% increase at post-intervention (M = 98.6%). Problem behaviour in the waitlist control group slightly increased by 6% from the first to the second baseline (M = 21. 9% and 27.9%, respectively), but showed a 27.4% decrease to near zero levels at post-intervention (M = 0.5%). When comparing the experimental group with the waitlist control group across each assessment period, statistically significant differences in both participant engagement and problem behaviour only occurred when the experimental group received intervention while the waitlist control group remained in baseline conditions during Assessment II (M = 97% engagement and 2% problem behaviour for experimental group; and M = 71.7% engagement and 27.9% problem behaviour for waitlist control group). Evidence of an association between the I CAN Get Fit program and maintenance of improvements in participant engagement and problem behavior can be seen in the modest but non-significant further improvements in participant engagement and problem behaviour by the experimental group during follow-up. The descriptive analysis of individual data for participant engagement and problem behaviour showed that the participants with a history of little to no problem behaviour performed as expected, in which they maintained a high level of engagement

and near zero levels of problem behaviour across baseline, post-intervention, and follow-up. The participants with a history of mild to moderate problem behaviour also met expectations, in which they demonstrated lower levels of engagement and mild to moderate levels of problem behaviour at baseline, and improved to high levels of engagement and near zero levels of problem behaviour at post-intervention.

In regard to physical fitness, the results of the randomized control trial showed little to no effects on the four measures of physical fitness: aerobic fitness, BMI, flexibility and muscular strength. In retrospect, this is understandable given that physical fitness typically requires more frequent and a longer duration of exposure to physical activity to demonstrate improvements. The descriptive analysis of individual physical measures showed that nine of the fourteen participants in the study entered the study in the normal or healthy BMI range. For those participants, BMI did not change throughout the study. However, for the five participants that entered the study in the overweight or obese range, a small improvement was evidenced. This suggests that if the program were maintained for a longer period of time, or a home-based maintenance program was developed in collaboration with the participants' families, additional improvements in BMI may have been seen. Another promising outcome evidenced in the individual data for aerobic fitness, flexibility and muscle strength was an average of 69% percentage of participants across both groups showed improvement at post-intervention, and for the experimental group during follow-up, approximately half (i.e., 52%) maintained these improvements at follow-up. This suggests that a 12 session, 6 week fitness program may have benefit for a smaller cohort of participants with autism, and that a program with more sessions across a longer period of time may prove to be more effective at improving the physical fitness of participants.

In regard to interpersonal relationships, results suggest that although the fitness program improved interpersonal relationships at post-intervention, these changes were transitory and weak. For interpersonal relationships, the experimental group showed a statistically significant increase from baseline to post-intervention. This effect did not maintain during follow-up, in which interpersonal relationships decreased back down to near baseline levels. The waitlist control group also showed, a statistically significant increase, in this case, from the second baseline to post-intervention that matched the results of the experimental group. However, for both the experimental and waitlist control groups, during Assessment III (i.e., follow-up for the experimental group and post-intervention for the waitlist group) the levels of social relationships were only slightly higher than the first baseline suggesting a weak effect at best.

When comparing the experimental group with the waitlist control group across assessment periods, improvements in interpersonal relationships occurred when the experimental group received the intervention while the waitlist control group remained in baseline conditions. These results indicate that participation in the I CAN Get Fit program contributed to a modest increase in interpersonal relationships immediately post-intervention. However the decrease in interpersonal relationships to near baseline levels during follow-up for the experimental group further suggest a weak effect of the fitness program. Considering the social nature of the fitness program, the increase in social relationships post-intervention was likely an artifact of the new relationships provided by the program itself, including fitness instructors and fellow participants. During follow-up with the experimental group, the termination of the fitness program closely matched the decrease in social relationships. The descriptive analysis of individual results for social relationships was consistent with the pattern of change observed in the group comparison results, with 13 of 14 participants showing an increase in relationships at post-intervention but

only 2 of 7 participants in the experimental group maintaining these improvements at follow-up. These data largely confirm the transitory and artifactual nature of these improvements.

In regard to community involvement, results suggest that the fitness program had little to no effect on the participant's community involvement. Neither the experimental group nor the waitlist control group showed improvements in community involvement from baseline to post-intervention, and the differences between both groups were non-significant at each assessment point. The descriptive analysis of individual scores revealed that only one participant in the experimental group showed an increase in community involvement at post-intervention, while the other participants showed a decrease or no change in community involvement at post-intervention.

In regard to social validity, stakeholders rated social validity very high, with an overall average of 4.6 on a 5-point scale. These results indicate that fitness instructors, participants and parents viewed the goals, procedures, and outcomes of the I Can Get Fit program as important, acceptable, and viable.

There also were unanticipated positive outcomes associated with participation in the I CAN Get Fit program. In addition to the quantitative results, participants, instructors, and parents provided comments that offered anecdotal evidence of outcomes that extended beyond the specific aims of the BST and PBS enhanced fitness program. Ten out of fourteen families in the program spoke of the importance of the continued availability of such fitness programs for adolescents and young adults with autism. In addition, seven of the 14 participants across the experimental and waitlist control groups inquired about how to sign up for future fitness classes to continue their fitness regime. This anecdotal evidence of sustained interest in the fitness

program led to further collaboration between myself and the UBC BodyWorks Program Manager to implement a group fitness program to occur after the research study ended. Three instructors from the study applied to work in the future program and two other instructors from the study expressed interest in working in the future program, but could not commit due to scheduling. In addition, one instructor from the study applied and was hired to work in other Canucks Autism Network sports and recreation programs, teaching hockey, soccer, basketball and physical literacy to children, teens, and young adults with autism. As indicated in the results of the social measures, for some participants, participation in the I CAN Get Fit program was the only source of interpersonal relationships and community involvement, other than with their immediate family. One participant travelled two hours to and from the gym each day, and reported that the fitness program was the only reason he left his house on those days. Another participant's parent reported that his son was normally slow to transition out of the house and quiet during car rides, but on fitness class days, he was always dressed and ready to go and chatted all the way home from the gym. The program also brought forth an opportunity for family bonding, in which two families started working out together after they realized their respective children who participated in the I CAN Get Fit program had learned skills necessary to successfully exercise in a gym setting.

Relation to the Literature

The study provides an effective and efficient model for fitness instructors to support adolescents and young adults with autism that directly addresses the recommendations of Healy et al. (2016) to increase training in curriculum development, behavior management, and communication skills for teaching physical activity to individuals with autism. Similar to Jull and Mirenda (2015), the I CAN Get Fit program employed a half-day, in-class workshop using BST

to teach evidence-based teaching and Positive Behaviour Support strategies to fitness instructors to support individuals with autism to successfully participate in the recreation setting. *In vivo* instructor training was provided in the recreation setting once per week, for six weeks. As in the Jull and Mirenda study, this training program resulted in improvements in instructor implementation, and in participant engagement and problem behaviour. These results provide additional empirical evidence for BST as an effective and efficient method for teaching recreation providers to implement evidence-based teaching and Positive Behaviour Support strategies. This study also directly addresses the recommendations of Jull and Mirenda to include a "train the trainer" model in future research. This model involves training instructors who already are working in the natural environment of community-based recreation centers. Instructors who participated in the study were existing employees of the UBC BodyWorks facility, and so they continued to work in the facility after the study was completed. By working in the natural environment with natural agents of change, as suggested by Jull and Mirenda, the likelihood of the study having an impact on the continuation of the program in the community beyond the life of the study increased. This is why it was possible, through parent advocacy, for the group fitness to continue after the study was completed.

Unique Contributions to Literature

The study makes two unique contributions to the literature on community-based leisure programs for persons with autism. First, the study is the first to conduct a randomized control trial to document the effectiveness of a fitness program infused with BST and PBS and delivered by fitness instructors in a natural community-based leisure setting with adolescents and young adults with autism, some of whom engaged in moderate levels of problem behaviour.

Second, the study represents the first effectiveness study on community based leisure

programs for persons with autism. Natural change agents (i.e., fitness instructors) implemented the intervention in a natural performance setting (i.e., UBC Bodyworks Fitness Centre) under real world conditions (e.g., paid certified fitness instructors, fitness classes held once per week, parents providing transportation). As in other effectiveness studies, in which an intervention is implemented under real-world conditions, the randomized control trial included a representative sample of the populations of interest, a detailed description of the intervention, a description and precise measurement of target outcomes, and readily available technical assistance. Like efficacy studies, in which an intervention is implemented under ideal conditions, effectiveness studies require rigorous and controlled research designs. However, effectiveness studies focus on adaptation and fidelity of program implementation in naturalistic conditions, which then may yield results similar to conditions in the real world.

Chorpita (2003) and Flay et al. (2005) have argued that the effective and widespread dissemination of evidence-based practices requires effectiveness studies in addition to efficacy studies, Chorpita has argued that one reason for the gap between research and practice in the field of clinical psychology is the predominance of efficacy studies in the intervention research literature and the relative dearth of effectiveness studies. Thus, this effectiveness study and its outcomes offer an initial contribution to the advancement of fitness programs infused with BST and PBS toward bridging the gap between research and practice in the education and treatment of individuals with autism in regard to successful participation in community recreation programs.

Implications

Results suggest that fitness programs led by certified instructors trained in PBS, in addition to their knowledge and skills in the area of fitness instruction, can successfully include members of the community who have autism and wish to participate in a community based fitness program. A key structural feature of the fitness program was that the groups were formed carefully to include both individuals with little to no history of problem behaviour and individuals with a history of moderate problem behaviour. The targeted nature of the fitness program and the training provided to fitness instructors are consistent with a model of behavioural support that is categorized as secondary prevention. In a system of positive behavioural support, there are three tiers (Lucyshyn, Dunlap & Freeman, 2015). The first tier involves primary or universal prevention strategies implemented across all individuals in a particular setting (e.g., a school, a community recreation program). The second tier involves targeted or secondary prevention strategies that can be delivered efficiently to a small group of individuals at risk within a particular setting. The third tier involves tertiary prevention in the form of assessment-based individualized, intensive intervention for a few individuals for whom universal and secondary prevention strategies are not sufficient to improve behaviour. The fourteen PBS strategies used in this study provided instructors with an efficient package of PBS strategies to support a targeted small group of individuals with autism, some of whom demonstrated a moderate level of problem behaviour. Tertiary level, functional assessment-based, multicomponent interventions were not required.

Given my findings, one important feature of an effective fitness group may be the selection of individuals with autism with little to no problem behaviour combined with individuals with autism and moderate levels of problem behaviour. The inclusion of both groups

of individuals with autism in the fitness classes made instruction by the fitness instructors more manageable, and provided opportunities for peer modeling of appropriate participation in the fitness activities. For example, it was observed during fitness classes that when participants were paired into dyads, instructors assigned peer models to demonstrate complex fitness activities. Instructors also brought attention to peers when they modeled appropriate behaviour, and this appeared to have a positive effect on other participants' behaviour during the fitness classes.

The positive outcomes of this study also suggest that behaviour analysts with skills in both BST and PBS area well positioned to effectively and efficiently train and support fitness instructors working with youth and young adults in community-based fitness programs. Community-based fitness programs, including community centres that provide fitness programs, will do well to hire behavior analysts on a full or part-time basis to build the capacity of centre staff to successfully include persons with autism in fitness programs in their facilities. In addition, the outcomes of the study suggest that fitness instructors with no prior training in supporting individuals with autism or in Positive Behaviour Support are able to successfully integrate PBS strategies into their established repertoire of skills as fitness instructors and to do so in a relatively short period of time with a reasonable amount of training and support.

A final implication is that to have an effect on physical fitness measures, a group fitness program for adolescents and young adults with autism may need to include carry-over activities into the home with support, such as individualized home training plans in order to promote continued improvements in physical fitness. In addition, for individuals in fitness programs that include a focus on weight loss and management, it also would be important to give families information about diet and nutrition management.

Limitations and Cautions

Three limitations or cautions require the reader's attention. First, the 6-week fitness program did not prove to be a sufficient condition to demonstrate overall and sustained improvements in physical fitness. A longer duration of time, paired with additional coaching to build habits for incorporating physical activity into home practice, may have allowed the participants to make further progress in aerobic fitness, flexibility, and muscular strength. For BMI, weight was maintained for most participants, and small changes were made for individuals who classified as overweight or obese. To have further impact on BMI for individuals outside of the normal or healthy range, additional strategies such as nutritional planning may be necessary.

Second, while improvements in interpersonal relationships occurred after intervention for both the experimental and wait list control groups, these effects did not appear to endure at follow-up, as evidenced by follow-up results for the experimental group. Interpersonal relationships were measured using the Social Network Analysis Form as the total number of interpersonal relationships that each participant experienced. Participation in the I CAN Get Fit program appears to have temporarily increased the number of interpersonal relationships that participants experienced during the study. As a result, during post-intervention assessment participants included the staff and other participants in the study in the count of the number of interpersonal relationships. Consequently, when the fitness program terminated after 6 weeks and measurement occurred again at follow-up for the experimental group, the number of interpersonal relationships that participants experienced returned to near baseline levels.

Finally, participants in this study only demonstrated low to moderate levels of problem behaviour. This level of problem behaviour likely played a role in the participants' immediate

and positive response to the instructors' implementation of PBS strategies. More severe or frequent problem behaviour may have posed greater challenges to instructors, and thus may have constrained the positive results for instructor implementation of PBS strategies, participant engagement, and problem behaviour.

Future Research

Given the results as well as the limitations and cautions of the study, four areas of future research should be considered. First, the promising preliminary results of the study suggest the conduct of a series of experimental group comparison studies that further investigate the effectiveness and acceptability of the I CAN Get Fit program. If similar results are obtained, the fitness program may eventually meet established criteria for an evidence-based practice (EBP). As defined by Gersten et al. (2005) and the Council for Exceptional Children (2014), EBP criteria for comparison group studies include: (a) at least two high quality group design studies (i.e., experimental design with random assignment); (b) four acceptable quality group design studies (i.e., quasi-experimental design with non-random assignment; (c) positive effects in all studies; and (d) a total of 60 participants across high quality studies or 120 participants across acceptable quality studies.

Second, considering the short time period in which the fitness program was conducted (i.e., 6 weeks), future research should consider instituting a larger number of group fitness classes over a longer period of time. Doing so may serve to assess whether or not participation in an extended fitness program has a positive effect on physical fitness. Future studies also should consider including measures of physical fitness that may be amenable to change within a 12 session, 6-week fitness program, such as measures of balance, endurance (i.e., numbers of

repetitions), and the fidelity in which participants engage in a particular fitness activity. Third, because the study involved a small number of participants, future research should employ a larger sample size to further investigate the effects of fitness instructor training in PBS using BST on participant behavioural, physical fitness, interpersonal relationship and community participation outcomes. Doing so also would serve to further advance the establishment of the I CAN Get Fit program as an evidence-based practice given the EBP criteria of a total of 60 participants across experimental group comparison studies. Finally, to further extend the generalizability of the fitness program, future research also should investigate these outcomes with individuals with autism that exhibit severe problem behaviour, and with different age populations, types of physical activities, and recreation environments.

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Appendix A
Participant Recruitment Letter

DATE

Dear Parent/Guardian/Self-Advocate:

The purpose of this letter is to inform you of an opportunity to participate in a research study whose purpose is to provide a physical fitness program for adolescents and young adults with autism who have had difficulty participating in sports and recreation programs in the past. The study is entitled "Instructor Implemented Positive Behaviour Support in a Fitness Program for Adolescents and Adults with Autism" The study will be conducted by the University of British Columbia. The Principal Investigator (PI) of the study is Dr. Joseph Lucyshyn, Associate Professor in the Faculty of Education of the University of British Columbia. The graduate student researcher is Tara Rodas. The research study is for the fulfillment of degree requirements for the Master of Arts degree.

The purpose of this study is to examine the effectiveness of an instructor led physical fitness program for adolescents and adults with autism who have had difficulty participating in sports and recreation programs in the past due to problem behavior. The fitness program will be infused with Positive Behaviour Support strategies, an approach that has been shown to be effective for individuals with autism in the home and school setting. The study will evaluate the extent to which the program:

1) increases participant engagement in the fitness program and decreases problem behaviour in the fitness program;
2) improves participant Body Mass Index, muscular strength, flexibility, and aerobic fitness for adolescents and adults with autism;
3) increases interpersonal relations and community involvement for adolescents and adults with autism; and
4) provides the opportunity for fitness instructors increase their skills in implementing Positive Behaviour Support strategies to effectively support adolescents and adults with autism.

Intervention activities will include:

1) group fitness activities led by certified personal trainers in a community setting

Research activities will include:

1) preliminary assessment(s)* to obtain initial information regarding interpersonal relations, community involvement, and physical health

2) videotaped observations during the one third of the program; and
3) post-program assessment(s)* of interpersonal relations, community involvement, and physical health

*Some participants will participate in two preliminary assessments and one post-program assessment, and some participants will participate in one preliminary assessment and two post-program assessments.

Intervention and research activities will occur across a 4-month period. During the intervention activities, adolescents and adults will participate in the fitness program for 1 hour per day, twice a week for 6 consecutive weeks. The program will be scheduled at consistent times and days of the week, and will take place in the evening. During measurement activities, participants will participate in 60-minute sessions, and will complete physical assessments, assessment instruments and structured interviews. Measurement activities will be scheduled on days that are consistent with the fitness program and are convenient for participants and family members. Physical assessments will take approximately 15 minutes, assessment instruments will take a total of 30 minutes, and interviews will take a total of 60 minutes

Individuals who choose to participate in this study may experience four benefits. First, individuals may show physical health improvements such as changes in weight, body composition, and increased muscular strength, flexibility, and aerobic ability. Second, individuals may develop new behaviours and skills that help them participate in similar activities in the community. Lastly, other individuals with autism may potentially be helped through the sharing of knowledge gained in this study.

If you are interested in participating in the study, or learning more about the study, please contact Joe Lucyshyn. You may also contact Tara. Alternatively, you may also contact the organization who gave or sent you this introductory letter. At that time, if you give permission to the organization permission to release your name and phone number, Tara Rodas will contact you by telephone to answer any questions that you may have. In any event, thank you for your time and consideration.

Sincerely,

Associate Professor
Faculty of Education
University of British Columbia

Graduate Student Researcher
Faculty of Education
University of Brtisih Columbia

UBC Faculty of Education
2125 Main Mall
Vancouver, BC, Canada, V6T 1Z4

Appendix B
Instructor Recruitment Letter

DATE

Dear UBC Student:

The purpose of this letter is to inform you of an opportunity to participate in a paid research study opportunity. The purpose of this study is to provide a physical fitness program for adolescents and adults with autism who have had difficulty participating in sports and recreation programs in the past. The study is entitled "Instructor Implemented Positive Behaviour Support in a Fitness Program for Adolescents and Adults with Autism" and will be conducted by the University of British Columbia. The Principal Investigator (PI) of the study is Dr. Joeseph Lucyshyn, Associate Professor in the Faculty of Education of the University of British Columbia. The graduate student researcher is Tara Rodas. The research study is for the fulfillment of degree requirements for the Master of Arts degree.

The purpose of this study is to examine the effectiveness and impact of an instructor led physical fitness program for adolescents and adults with autism who have had difficulty participating in sports and recreation programs in the past. The program will be infused with Positive Behaviour Support strategies, an approach that has been shown to be effective for individuals with autism in the home and school setting. The study will evaluate the extent to which the program:

1) increases participant engagement in the fitness program and decreases problem behaviour in the fitness program;
2) improves participant Body Mass Index, muscular strength, flexibility, and aerobic fitness for adolescents and adults with autism;
3) increases interpersonal relations and community involvement for adolescents and adults with autism; and
4) provides the opportunity for fitness instructors increase their skills in implementing Positive Behaviour Support strategies to effectively support adolescents and adults with autism.

UBC students participating in the program will participate in activities intended to increase their abilities as fitness instructors including:

1) implementing group fitness sessions for individuals with autism in a community setting; and
2) implementing Positive Behaviour Support strategies to increase participant engagement and decrease problem behaviour.
   Research activities will include:

1) videotaped observations during measurement activities;
2) participation in training intended to increase knowledge and efficacy;
3) implementing a fitness program for adolescents and adults with autism with the support of a behaviour analyst; and
4) a self-reported questionnaire assessing your perspective and experience during your participation in the program.

Intervention and research activities will occur across a 4-month period. During the intervention activities, you will be part of a team of instructors leading the fitness program for 1 hour per day, twice a week for 6 consecutive weeks. The program will be scheduled at consistent times and days of the week, and will take place in the evening. You will also attend a paid, full-day training session prior to the start of the program. During measurement activities, you will be involved in instructing a fitness program for 60-minutes. Measurement activities will be scheduled on days that are consistent with the fitness program. At the end of the study, you will be asked to complete a questionnaire that will take a maximum of 10 minutes.

Students who choose to participate in this study may experience four benefits. First, you will gain paid employment as a certified personal trainer. Second, you may gain knowledge and direct experience working with adolescents and adults with autism. Third, you may develop new skills that help you increase your efficacy working with other individuals. Lastly, other individuals may potentially be helped through the sharing of knowledge gained in this study.

If you are interested in participating in the study, or learning more about the study, please contact Joe Lucyshyn. You may also contact Tara Rodas. Alternatively, you may also contact the organization who gave or sent you this introductory letter. At that time, if you give permission to the organization permission to release your name and phone number, Tara Rodas will contact you by telephone to answer any questions that you may have. In any event, thank you for your time and consideration.

Sincerely,

Associate Professor
Faculty of Education
University of British Columbia

Graduate Student Researcher
Faculty of Education
University of Brtisih Columbia

Appendix C

Fitness Lesson Plan Example

Activity	Sets	Reps
Group Warm Up: 3 Minutes		
• Jogging laps	1	4
• Butt kicks	1	2
• RDL Forward Reach	1	2
• Inchworms	1	2
• High kicks	1	2
Circuit #1: 5 Minutes		
• Swimmer pulls	2	30
• Walking lunges	2	30
• Hip raises	2	10 x each side
• Leg lifts	2	20
Circuit #2: 5 Minutes		
• Figure 8 pylon drill	2	20
• Run gym lengths	2	4
• Oblique crunches	2	25
• Single leg squats	2	20
Circuit #3: 5 Minutes		
• Bear walks	2	2
• Wall squats	2	20
• Medicine ball sit ups	2	15
• Mountain Climbers	2	10
Dynamic Cool Down: 3 Minutes		
• Slow jog/walk	1	3 min
Stretch: 3 Minutes		
• Neck rotations	• Shoulder stretch	
• Toe touch	• Bicep stretch	
• Quad stretch 1-legged balance	• Tricep stretch	
• Forward lunge hamstring stretch		
• Calf stretch		
Notes:		

Appendix D
Social Validity Questionnaire - Participant

1. I enjoyed participating in I CAN Get Fit.

   1 2 3 4 5

2. I enjoyed participating in physical fitness activities.

   1 2 3 4 5

3. My instructor was helpful.

   1 2 3 4 5

4. I CAN Get Fit improved my physical fitness and knowledge of health.

   1 2 3 4 5

5. I would like to continue participating in physical fitness activities.

   1 2 3 4 5

6. After participating in I CAN Get Fit I know about activities I like to do in my community.

   1 2 3 4 5

7. I am satisfied with the program outcomes.

   1 2 3 4 5

Appendix E
Social Validity Questionnaire – Parent or Caregiver

1. My son/daughter seemed to enjoy participating in I CAN Get Fit.

   1 2 3 4 5

2. My son/daughter seemed to enjoy participating in physical fitness activities.

   1 2 3 4 5

3. My son/daughter got to know new people at the I CAN Get Fit program.

   1 2 3 4 5

4. I CAN Get Fit improved my son/daughter's physical fitness and knowledge of health.

   1 2 3 4 5

5. I would like my son/daughter to continue participating in physical fitness activities.

   1 2 3 4 5

6. After participating in I CAN Get Fit I know about activities my son/daughter likes to do in my community.

   1 2 3 4 5

7. I am satisfied with the program outcomes.

   1 2 3 4 5

Appendix F

Social Validity Questionnaire - Instructor

1. Fitness lesson plans were easy to implement.

   1 2 3 4 5

2. Implementing Positive Behaviour Support strategies was simple.

   1 2 3 4 5

3. I felt confident that I could use the Positive Behaviour Support strategies successfully.

   1 2 3 4 5

4. I felt that using Positive Behaviour Support strategies improved my ability to instruct.

   1 2 3 4 5

5. Using these strategies in my daily practice would increase my effectiveness as an instructor.

   1 2 3 4 5

6. It would be enjoyable for me to continue to use these strategies.

   1 2 3 4 5

7. I am satisfied with the program outcomes.

   1 2 3 4 5

8. I enjoyed instructing the I CAN Get Fit program.

   1 2 3 4 5