

**Increasing Physical Activity and Self-Determination for Individuals with Autism
Spectrum Disorder**

Teri Todd

Department of Educational and Counselling Psychology

McGill University

May, 2007

**A thesis submitted to McGill University in partial fulfillment of the requirements for the
degree of Doctor of Philosophy in Educational and Counselling Psychology**

© Teri Todd 2007



Library and
Archives Canada

Published Heritage
Branch

395 Wellington Street
Ottawa ON K1A 0N4
Canada

Bibliothèque et
Archives Canada

Direction du
Patrimoine de l'édition

395, rue Wellington
Ottawa ON K1A 0N4
Canada

Your file Votre référence
ISBN: 978-0-494-38654-5
Our file Notre référence
ISBN: 978-0-494-38654-5

NOTICE:

The author has granted a non-exclusive license allowing Library and Archives Canada to reproduce, publish, archive, preserve, conserve, communicate to the public by telecommunication or on the Internet, loan, distribute and sell theses worldwide, for commercial or non-commercial purposes, in microform, paper, electronic and/or any other formats.

The author retains copyright ownership and moral rights in this thesis. Neither the thesis nor substantial extracts from it may be printed or otherwise reproduced without the author's permission.

AVIS:

L'auteur a accordé une licence non exclusive permettant à la Bibliothèque et Archives Canada de reproduire, publier, archiver, sauvegarder, conserver, transmettre au public par télécommunication ou par l'Internet, prêter, distribuer et vendre des thèses partout dans le monde, à des fins commerciales ou autres, sur support microforme, papier, électronique et/ou autres formats.

L'auteur conserve la propriété du droit d'auteur et des droits moraux qui protège cette thèse. Ni la thèse ni des extraits substantiels de celle-ci ne doivent être imprimés ou autrement reproduits sans son autorisation.

In compliance with the Canadian Privacy Act some supporting forms may have been removed from this thesis.

Conformément à la loi canadienne sur la protection de la vie privée, quelques formulaires secondaires ont été enlevés de cette thèse.

While these forms may be included in the document page count, their removal does not represent any loss of content from the thesis.

Bien que ces formulaires aient inclus dans la pagination, il n'y aura aucun contenu manquant.


Canada

Abstract

Despite the important benefits of physical activity, many people with autism spectrum disorder (ASD) have difficulty participating long enough to reap the rewards. Poor motor skills, difficulty planning movements, problems functioning in open environments, and low motivation combine to make sustained participation a challenge. This dissertation is a series of three studies designed to develop and assess intervention, based on self-determination theory, which promotes sustained physical activity for adolescents and young adults with ASD functioning at the low end of the spectrum. The studies were carried out at a high school for students with intellectual disabilities over three consecutive years. The results of studies 1 and 2 were used to adapt the intervention to meet the needs of this population. Recent research has shown that when people act in a self-determined manner they become more engaged in what they are doing. The intervention for study 1 included one self-determination skill, self-monitoring. Goal-setting was added during study 2, this resulted in participants setting goals and self-monitoring as they walked and jogged. The intervention for the third study included 3 self-determination skills: goal-setting, self-monitoring, and self-reinforcement. The self-determination attitude of self-efficacy was measured during study 3 to better understand the relationship between self-efficacy and physical activity for individuals with ASD. Distance walked, jogged, or cycled, increased during studies 1 and 3. Visual methodologies were used during studies 2 and 3 to provide these participants with severe communication problems the opportunity to share their experiences during the physical activity with the researchers. Participants and teachers interpreted the facial expressions, which were captured with photographs, in terms of affect but their interpretations did not always match. The participants indicated that enjoyment of the activity increased over the

duration of the physical activity program but this was not always obvious to the teachers. It was concluded that interventions which include self-determination skills increase engagement and enjoyment during physical activity for adolescents and young adults with ASD.

Résumé

En prenant compte des bons effets de l'activité physique beaucoup de gens avec l'autisme et les troubles envahissants du développement ont de la difficulté à participer assez long temps pour sentir ces bons effets. Pauvre en compétence moteur, difficulté à planifier les actions, problèmes à fonctionner dans un environnement libre, et manque de motivation sont combinés pour rendre la participation soutenue un défi. Cette dissertation se compose de trois études dessinées à développer et mesurer une intervention pour promouvoir l'activité physique soutenue chez les adolescents et jeunes adultes dont l'autisme qui se trouve vers le niveaux bas du spectre de fonctionnement. Les études ont pris place dans une école secondaire pour étudiants avec les capacités intellectuelles réduites, au cours de trois années consécutives. Les résultats de la première et deuxième études ont été utilisés pour adapter l'intervention aux besoins de cette population. Les interventions ont été guidées par la théorie d'autodétermination qui indique que les gens deviennent plus engagés dans ce qu'ils font. La première étude a incluse une compétence d'autodétermination, contrôle automatique. Ce cadre a été ajouté à la deuxième étude, ce qui a donné que les participants mettaient leurs propres buts et contrôle automatique lorsqu'ils marchaient et couraient. L'intervention pour la troisième étude a incluse trois compétences d'autodétermination: le cadre de but, le contrôle automatique, et la confiance en soi. La confiance en soi et efficacité en soi ont été menées pendant la troisième étude pour mieux comprendre la relation entre l'efficacité en soi et l'activité physique chez les gens qui ont l'autisme. La distance marchée, courue, ou à vélo se sont prolongées au cours de la première et troisième études; en plus de mesurer la distance parcourue des méthodologies visuelles ont été utilisées pendant la deuxième et la troisième études pour donner aux participants avec problèmes de communications graves la capacité de

partager leur expériences avec les chercheurs. Les participants et les professeurs ont interprétés les expressions photographiées des visages en termes d'émotions; leurs interprétations n'ont pas été les mêmes. Les participants ont indiqué que le plaisir de l'activité a grandi au cours l'activité physique du programme mais ceci a été difficile à mesurer par observation seule. Des rapports ont prouvés d'être non seulement fiables mais essentiels pour comprendre les effets sur les participants. En conclusion, les interventions qui comprennent des compétences d'autodétermination résultent dans un plus grand engagement et jouissance lors de l'activité physique des adolescents et jeunes adultes avec l'autisme.

Acknowledgements

This research would not have been possible without the help of eleven students with ASD who willingly, even enthusiastically, attended a physical activity program. Their smiles and pleasure at being outside, enjoying sunny days, warm breezes, and the ability to move, energized me. The principal and teachers were interested and supportive of the program. To all of these people, thank you.

I would like to acknowledge all of the professors at McGill University with whom I studied; I thank you for providing a sound footing on which to grow. As you continually challenged me to expand my knowledge I learned to be critical, open, and to ask and answer questions. Several professors had profound influences on the direction my research took. Dr. Jim Hanrahan had the job of guiding me through the history of educational psychology, and instructing me to write in a timely and succinct manner. Dr. Robert Bracewell provided insight in the area of learning and prompted me to view skill acquisition through a different lens. Dr. Peggy Downey introduced me to qualitative research in the area of physical activity; she always had thoughtful feedback and encouragement as I investigated non-traditional methodologies. Dr. Lynn Butler-Kisber encouraged me to experiment with visual methodologies, providing insight and guidance throughout the thesis process.

A special thank you to Dr. Greg Reid, you have been my supervisor, teacher, and friend for many years. At the beginning of this journey Dr. Reid drew a picture of a river and explained that the Ph.D. journey was like a raft floating down the river, you know the general direction and destination of the journey but the numerous twists and turns, plus the time to get there, are yet to be discovered. I now understand the metaphor and want to thank Dr. Reid for being my river guide. This process was more than academic; it involved growth and change in

many areas, thank you Greg for your patience, understanding, and above all for believing in me.

Many thanks to friends who encouraged me along the way, who listened attentively after they made the error of asking "So what is your research about?", one question I always answered with enthusiasm. A special thank you to Marian, our many lunches kept me sane. Lesley who understood the need to view many of the challenges of raising children with autism with humor and compassion, and always kept me focused on the importance of furthering our knowledge on this subject. And to Susan, who took over the role of 'mom' whenever I needed to travel.

This journey could not have come to fruition without the support of my family. Shannon and Leah, thank you for your tolerance as Mom spent hours barricaded in the study, and hogged the computer! Your continued encouragement and unwavering pride in my accomplishments was awesome. Travis you have been, and always will be, an inspiration. Jim, having a wife with a mid-life pursuit is sometimes not easy, but with love, humour, and devotion we have reached the finish line together, thank you.

Table of Contents

	page
Title page	1
Abstract	2
Resume	4
Acknowledgements	6
Table of Contents	8
List of Figures, Appendices, and Tables	10
Introduction	12
 Chapter 1 The Evolution of a Theory of Self-Determination	
History of self-determination	15
Self-determination and Disability	19
Self-determination as an Educational Construct	21
The Tripartite Ecological Theory of Self-determination	24
Conclusion	27
References	29
Bridging Manuscripts and Author Contribution	34
 Chapter 2 Increasing Physical Activity in Individuals with Autism	
Abstract	35
Introduction	36
Purpose	39
Method	39
Results	48
Discussion	50
References	56
Figures	61
Bridging Manuscripts and Author Contributions	66
 Chapter 3 Self-management and engagement of adolescents with ASD during physical Activity	
Abstract	67
Introduction	68
Purpose	72
Method	73
Results	89
Discussion	94
References	102
Figures	109
Bridging Manuscripts and Author Contributions	120

Chapter 4 Cycling for students with ASD: Self-regulation, self-efficacy, storytelling

Abstract	121
Introduction	122
Purpose	129
Method	129
Results	145
Discussion	149
References	158
Figures	166

Chapter 5 Summary

Introduction	173
References	181

Appendices	183
-------------------	------------

List of Figures, Appendices, and Tables

Chapter 2

Figure 1: Self-monitoring board	61
Figure 2: Distance Tom snowshoed/walked/ jogged over 28 sessions.	62
Figure 3: Distance Mike snowshoed/walked/jogged over 28 sessions	63
Figure 4: Distance Robert snowshoed/walked/jogged over 28 sessions	64
Figure 5: Number of verbal cues, encouragement and directives given by staff during selected sessions of the of the snowshoe/walk/jog program	65

Chapter 3

Figure 1: Self-monitoring/Goal-setting board	109
Figure 2: Goal setting card	110
Figure 3: Distance Tom walked/jogged	111
Figure 4: Distance Mary walked/jogged	112
Figure 5: Distance Liam walked/jogged	113
Figure 6: Distance Kyle walked/jogged	114
Figure 7: Number of circuits completed when participants selected the low intensity goal and the high intensity goal	115
Figure 8: Photographs of Mary rated from positive to negative affect by Mary, her parent, and five staff members. Trend lines show that Mary's affect became more positive throughout the program	116
Figure 9: Photographs of Tom rated from positive to negative affect by Tom and five staff members. Trend lines show that Tom's affect was stable throughout the program.	117
Figure 10: Photographs of Liam rated from positive to negative affect by Liam, his parent, and five staff members. Trend lines show that Liam's affect became more positive throughout the program.	118
Figure 11: Photographs of Kyle rated from positive to negative affect by Kyle, his parent, and five staff members. Trend lines show that Kyle's affect became more positive throughout the program.	119

Chapter 4

Figure 1: Self-monitoring/Goal-setting board	166
Figure 2: Self-efficacy questionnaire card	167
Figure 3 : Distance cycled by Lisa over 31 sessions. Goals set during Phase B2 and Maintenance are shown by the pink line, self-efficacy ratings are shown below the X-axis	168
Figure 4: Distance cycled by Daniel over 31 sessions. Goals set during Phase B2 and Maintenance are shown by the orange line, self-efficacy ratings are shown below the X-axis	169
Figure 5: Distance cycled by Mark over 30 sessions. Goals set during Phase B2 and Maintenance are shown by the blue line, self-efficacy ratings are shown below the X-axis	170
Figure 6: Average time per circuit when slow or fast goal was chosen	171

Figure 7: Page from Mark's photograph album

172

Appendices

Appendix A: Ethics form for studies 1, 2, and 3

183

Appendix B: Letter of consent for study 1

186

Appendix C: Letter of consent for study 2

187

Appendix D: Letter of consent for study 3

188

Introduction

North American news headlines have alerted the public to two growing issues which have influenced this thesis, lack of physical activity for today's youth and an increase in the number of students with autism spectrum disorder (ASD). Lifestyle changes and the introduction of technological games have, in part, contributed to sedentary lifestyles, but for individuals with ASD there are additional contributing factors. Many people with ASD have difficulty performing motor skills, find open environments in which many sports and physical activity take place overwhelming, are not able to generalize skills from one setting to another, and are not motivated to participate in physical activity. The objective of the research presented in this doctoral dissertation was to design an educational intervention to promote sustained physical activity for adolescents and young adults using self-determination skills.

The educational interventions of the three studies which make up the dissertation were guided by self-determination theories, specifically the functional theory of self-determination (Wehmeyer, 2003), the self-determined learning theory (Mithaug, Mithaug, Agran, Martin, & Wehmeyer, 2003). and the tripartite ecological theory of self-determination (Abery & Stancliffe, 2003). The three theories are complimentary and are based on the same premise that self-determination can be viewed as an educational construct which can be broken into component elements. One objective of the research was to empower students through opportunities to learn and use self-determination skills. As the research progressed the interventions were modified to included additional elements of self-determination.

Three empirical studies were carried out over a three year period. All of the studies used a similar educational intervention which was adapted according to the results of the previous research. For example, during study 1 the intervention consisted of self-monitoring

and edible and verbal reinforcement during a snowshoe/walk/jog activity. The intervention used for study 2 built on the success experienced in study 1 from self-monitoring and added a second element, goal setting. Each study used a different design, study 1 used a changing conditions design which limited inferences from the results. In an attempt to establish functional relationships during study 2, a repeated measures design was used. From the results of study 2 the intervention was changed to teach goal setting in a progressive manner, to track behavioral change a changing criterion design was employed. This reflective approach, building on the weakness of the previous study, strengthened the educational intervention.

Both quantitative and qualitative data were collected during studies 2 and 3, this was a result of suspecting that affect changed during the physical activity during study one. Visual methodologies were used to enable the participants, all non-verbal, to share their experience. The results helped shape the final intervention and suggested that visual methodologies are one method of accessing the 'voice' of individuals with ASD and severe communication problems. This mixed methodology approach was essential in recognizing that affect as well as physical ability play an important role in adherence.

The primary objective of this research endeavor was to engage adolescents and young adults with ASD, on the severe end of the spectrum, in 30-minutes of physical activity. Self-determination skills were recognized as key elements of the strategies adopted in this research, participants received instruction for these pivotal skills and opportunities to use the skills. Visual methodologies were used to encourage the participants to share their experiences and have a role in designing the intervention.

References

- Abery, B. & Stancliffe, R. (2003). A tripartite ecological theory of self-determination. In M. Wehmeyer, B. Abery, D. Mithaug, & R. Stancliffe (Eds.), *Theory in self-determination foundations for educational practice* (pp. 43-78). Springfield, Ill: Charles C Thomas.
- Mithaug, D., Mithaug, D., Agran, M., Martin, J., & Wehmeyer, M. (2003). Understanding the engagement problem. In D. Mithaug, D. Mithaug, M. Agran, J. Martin, & M. Wehmeyer (Eds.), *Self-determined learning theory* (pp.3-18). Hillsdale, NJ: Erlbaum.
- Wehmeyer, M. (2003). A functional theory of self-determination: Model overview. In M. Wehmeyer, B. Abery, D. Mithaug, & R. Stancliffe (Eds.), *Theory in self-determination foundations for educational practice*. (pp. 182-201). Springfield, Ill: Charles C Thomas.

Chapter 1

The Evolution of a Theory of Self-Determination

Self-determination is a valued concept in today's society. As the field of disability continues to evolve and people with disabilities demand to live in dignity, the concept of self-determination is central to quality of life. While there is movement towards a person-centered paradigm, which promotes self-determination in individuals with disabilities, there has been little study of these concepts for people with developmental disabilities (Attanasio, 2003). The purpose of this chapter is to explore the concept of self-determination and what it means for people with severe disabilities.

History of self-determination

Self-determination was first listed in the Shorter Oxford English Dictionary On Historical Perspectives in the year 1683 and was defined as "determination of one's mind or will by oneself or itself" (1967, p. 1835). The term originated from the philosophy of determinism which posited that events, including human behavior and action, are effects of preceding causes. Two basic forms of determinism are recognized, hard and soft (Geisler, 1998). Hard determinists believe in the law of causality, suggesting that behavior is guided by antecedents and consequences. Historically, some hard determinists posit that each act is caused by God and that humans have no free choice. In more recent years hard determinism is seen in the work of some behavioral psychologists such as Sigmund Freud and B.F. Skinner (Geisler). Soft determinists assume that acts can be caused or engaged in through free will. They believe that every action has an antecedent condition but that a person is not always compelled to act. Therefore, people are able to express their will over their actions. The debate of causality versus free will created much attention during the sixteenth and

seventeenth centuries, particularly in religious arenas where leaders were struggling with the idea of an all powerful God who dictated or punished human behavior. The issue arose that God could only hold humans accountable for their actions if those humans had the ability to act on their own volition, as opposed to earlier beliefs that all actions were predetermined by God.

Philosophical writings on the subject of determinism date back to Plato and Aristotle in ancient Greece. The debate continued for many years without resolve. In the early seventeenth century René Descartes explored the mind-body dualism in an attempt to separate physical facts, for example an object, from our beliefs about that object. Thomas Hobbes discussed the nature of causation of human action in his renowned work, the *Leviathan*. Hobbes took a middle ground explaining that men may act on will but all action comes from a cause, and God is the first of all causes (Hobbes, 1651/1991). In the footsteps of Descartes and Hobbes, John Locke continued to study mind-body connection and free will. One prominent piece of work by Locke in 1690, *An Essay Concerning Human Understanding*, established the foundations of a new science of human understanding and knowledge which adamantly opposed the position that humans were born with the idea of God. Locke espoused that humans were born with a blank mind, a *tabula rasa*, which is then filled through sensation and reflection (Locke, 1690/1979). He believed that ideas could be simple or complex, simple ideas being formed through experiences of sensation. Complex ideas were created three ways: i) by combining several simple ideas, ii) from viewing the relationship of two ideas, either simple or complex, at once, iii) by abstraction, separating one idea from all other ideas that accompany it (Locke). In this way man could develop ideas of things that exist only in perception, for example, the idea of power. Locke went on to explain that human actions

incorporated both sensory and reflective elements and included ideas of power, volition, and liberty. He believed that the mind had the power to start and cease action, the use of that power was by will or volition, and that freedom was “the power to act on our volition, whatever it may be, without any external compulsion or restraint” (Locke, Book II, XXI). The concept that actions can be both caused and volitional is important in understanding the modern sense of the term self-determination (Wehmeyer, 2003a).

The discipline of psychology emerged as distinct from philosophy in 1879 (Myers, 2001) when the issue of determinism was still being debated. Hard determinists such as Freud and Skinner believed that behavior was governed by causal factors, either internal or external respectively. Soft determinists such as Angyal (1958) believed that human behavior resulted from two essential determinants, autonomous (self) determinism and heteronomous (other) determinism and that action was rarely caused by only one or the other. Angyal explained that the autonomy of an organism is not absolute but is restricted by outside sources. Like Locke, Angyal differentiated freedom to act from actions being free.

The idea of this duality continued in psychology in efforts to explain human agency. In 1997 Albert Bandura, founder of social cognitive theory, wrote about determinism and freedom to have control over one’s life. He stated that freedom

is defined positively as the exercise of self-influence to bring about desired results...It is achieved through reflective thought, generative use of the knowledge and skills at one’s command, and other tolls of self-influence, which choice and execution of action require. Self-influences operate deterministically on behavior in the same way external influences do. Given the same environmental conditions, people who have the ability to exercise

many options are adept at regulating their own motivation and behavior will have greater freedom to make things happen than will those who have limited means of personal agency. It is because self-influence operates deterministically on action that some measure of freedom is possible (Bandura, 1997, p.7).

Self-determination research began in the 1970's and continues today. In the mid 1980's Edward Deci and Richard Ryan proposed a theory which attempted to explain intrinsically motivated behavior. Self-Determination Theory posits that humans are motivated to behave in a self-determined manner because it is an innate need; in particular, people act to fulfill the needs of autonomy, competency, and relatedness (Deci & Ryan, 1985). In the 1990's a group of researchers began exploring self-determination as an educational construct and attempted to break the construct into teachable components (e.g. Abery, Rudred, Schauben & Eggebeen, 1995; Wehmeyer, 1992). Today self-determination is studied through a variety of lenses; motivation theory, personality theory, educational psychology, social welfare, industrial psychology, national policy makers, and disability research (Wehmeyer, 2003a). The many fields which have adopted self-determination as a critical element underscores the importance of this construct to human life. It is largely believed that people who act in a self-determined manner are aware of their preferences, set goals for themselves, are assertive, use existing skills to achieve their goals, conduct ongoing evaluations to monitor progress toward their goal, and adjust their action plans as necessary (Abery et al., 1995; Deci & Ryan, 1985). It is also generally accepted that people who act in a self-determined manner have a better quality of life than people who are unable to operate with autonomy, self-regulation, empowerment, and direction.

Self-determination and Disability

During the second half of the twentieth century there was a move towards normalization led by Wolfe Wolfensberger . In his classic text on normalization, Wolfensberger (1972) included a chapter by Benjt Nirje titled The Right to Self-Determination. Nirje recognized the lack of control people with disabilities had over their lives. He believed that the principle of normalization dictated that people with disabilities were entitled to the respect which all people were due and when given this respect their needs and desires would be heard (Nirje, 1972). Nirje wrote that

Thus the choices, wishes, desires, and aspirations of a handicapped person have to be taken into consideration as much as possible in action affecting him...in the end, even the impaired person has to manage as a distinct individual, and thus has his identity defined to himself and to others through the circumstances and conditions of his existence. Thus, the road to self-determination is both difficult and all important for a person who is impaired (p. 177).

The normalization movement forced society to recognize people with disabilities as people with needs, desires, and wants like everyone else (Algozzine, Browder, Karvonen, Test & Wood, 2001).

During the early 1990's Wehmeyer and colleagues began developing the concept of self-determination as an educational construct addressing individuals with intellectual disabilities. In an attempt to empower people with disabilities to act in a self-determined manner Wehmeyer and colleagues saw self-determination as a dispositional characteristic of an individual which is made up of a set of skills (Wehmeyer, Kelchner, & Richards, 1996).

Curricula and other teaching tools were developed to foster self-determination skills for individuals with disabilities.

Despite significant advances throughout the last decade, and the fact that the idea of self-determination has been at the center of policies in countries around the world, many people with disabilities do not demonstrate self-determined behavior (Agran, Blanchard, & Wehmeyer, 2000; Hatton et al., 2004; Wehmeyer & Garner, 2003). There have been some positive findings; self-determination skills can be taught and learned by students with intellectual and developmental disabilities (Ganz & Sigafoos, 2005; King-Sears, 1999; Todd & Reid, 2006), and that use of self-determination skills can make a positive difference in the lives of individuals with disabilities (Agran & Wehmeyer, 2006; Fullerton & Coyne, 1999; Malette, Mirenda, Jones, Bunz, & Rogon, 1992; Miner & Bates, 1997). More disappointing are that the majority of individuals with disabilities have no control over meaningful events in their own lives. National surveys carried out in the United States consistently report that between 66 and 88% of individuals with intellectual disabilities, as defined by the American Association of Mental Retardation, do not have a say in where they live or work, who they live with, and who is hired to care for them (Agran et al, 2000; Algozzine et al, 2001, Wehmeyer & Metzler, 1995). Despite some progress in teaching self-determination skills to students with disabilities over the past 20 years, there are many students who leave school without these essential skills.

Opportunities to act in a self-determined manner may be linked to disability level. Wehmeyer (2005) found that the severity of a student's disability influenced the teacher's perception of the importance of self-determination. In a survey of 1,219 teachers he found that teachers rated the importance of learning self-determination skills considerable more

important for students with mild disabilities than for students with more severe disabilities. Teachers of students with severe disabilities felt that their students would not benefit from instruction in self-determination skills (Wehmeyer, Agran, & Hughes, 2000). Also meta-analysis published in 2001 demonstrated a lack of knowledge of how to teach self-determination skills to individuals with severe disabilities (Algozzine et al. 2001). There remains minimal research of the application of the self-determination constructs for students with severe disabilities (Wehmeyer, 2005).

Self-Determination as an Educational Construct

During the 1990's Micheal Wehmeyer studied self-determination as a construct important to, but missing from, the lives of people with intellectual disabilities (1992, 1994, 1998). He stated that classrooms in the United States which served students with intellectual disabilities often undermined their ability to act in a self-determining manner. Specifically he wrote that

aspects of the special education process which serve as barriers to this outcome (self-determination). The need to structure the special education classroom to meet educational, behavioral and administrative requirements may result in an environment promoting dependence and limiting choice and decision-making opportunities (Wehmeyer, 1992, p. 303)

Wehmeyer and colleagues set about defining self-determination in an operational way and breaking the concept into skills that could be taught to students with intellectual disabilities as part of their education. Self-determination, conceptualized as an educational outcome, was defined as "the attitudes and abilities necessary to act as the primary causal agent in one's life

and making choices and decisions regarding one's quality of life free from undue external influence or interference" (Wehmeyer, 1994, p 9).

In 1996 Wehmeyer and colleagues published a definitional framework of self-determination. The framework described four essential characteristics of self-determination and component elements and skills (Wehmeyer et al., 1996). The four characteristics essential to self-determination were autonomy, self-regulation, psychological empowerment, and self-realization. A behavior was considered autonomous if the person acted according to his or her own preferences, interests, and/or abilities and independently. Independently was characterized as free from undue external influence or interference. Self-regulation referred to a group of skills which enable a person to examine their environment and their repertoire of skills and to subsequently make decisions about how to act, to act, to evaluate the outcome of the action and revise their plan if necessary (Wehmeyer et al., 1996). The skills included in self-regulation are self-monitoring, self-evaluation, and self-reinforcement. Psychological empowerment was about personal control, a combination of personal efficacy and locus of control. Finally, self-realization referred to the idea that "self-determined people are self-realizing in that they use a comprehensive, and reasonably accurate, knowledge of themselves and their strengths and limitations to act in such a manner as to capitalize on this knowledge in a beneficial way" (Wehmeyer et al., p.633). The four characteristics develop as individuals learn, and have the opportunity to use, component elements such as choice-making, decision-making, problem-solving, goal-setting and attainment skills, independence, risk-taking and safety skills, self-observation, evaluation and reinforcement skills, self-instruction skills, self-advocacy and leadership skills, internal locus of control, positive attributions of efficacy and outcome expectancy, self-awareness, and self-knowledge. When people are able to effectively

use the skills listed as component elements they are able to behave in a self-determined manner.

Presently known as the functional theory of self-determination, this framework has laid the foundation for research on how to use the elements in a school environment, the impact on the students, and the design of curriculum models (Wehmeyer, 2003c). The primary reason to teach self-determination skills was to promote an effective transition from school to work and other adult services such as alternative living environments (Wehmeyer, 2003b). In 2003 Mithaug and colleagues outlined the self-determined learning theory which described the positive effects self-determination can have in learning environments; this led to a practical application described by the self-determined learning model (Mithaug, Mithaug, Agran, Martin, & Wehmeyer). This model incorporated all of the components contained in Wehmeyer's theory and posits that as students learn to use self-determined behaviors they become engaged in the activities presented.

The framework allowed studies to look at one characteristic of self-determination at a time. In addition, at least seven educational curricula, based on this framework, designed to teach the skills necessary to develop these characteristics, were made available to public school teachers in the late 1990s (e.g. Wehmeyer & Sands, 1998). Evidence of the effectiveness of teaching self-determination skills began to accumulate. In 2001 a meta-analysis of the effects of interventions to promote self-determination for individuals with disabilities was published (Algozzine et al., 2001). All components of self-determination were reflected in the reviewed studies but not on an equal basis. Many studies focused on choice, an element of autonomy (Algozzine et al., 2001, Test, Fowler, Brewer & Wood, 2005). Other component elements which were successfully taught to students with intellectual and

developmental disabilities included self-monitoring, self-instruction, and self-advocacy skills (Test et al., 2005). There has been less focus on goal-setting and problem solving for this population.

During the last decade another theoretical perspective of self-determination with implications to educational practices has emerged, Abery and Stancliffe's Tripartite Ecological Theory of Self-Determination (2003). Similar to Wehmeyer's functional theory in that self-determination is broken into teachable components and causal agency is recognized as an important characteristic, but the person-environment interaction is viewed differently. The functional theory proposes that self-determination is a functional characteristic of people and it emerges as people acquire a set of component elements of self-determined behavior (Wehmeyer, 2003b). The ecological theory takes a broader approach giving equal emphasis to a person's ability to behave in a self-determined manner, their desire to act that way, and the environment in which they operate.

The Tripartite Ecological Theory of Self-determination

In the context of this theory, self-determination is defined as "a complex process the ultimate goal of which is to achieve the level of personal control over life that an individual desires within those areas the individual perceives as important" (Abery & Stancliffe, 2003 p.27). Abery and colleagues view self-determination as individualized, some people desiring to be in control in the majority of situations while others are content to exert little control over their environment (Abery et al., 1995; Abery & Stancliffe). The recognition that a person may consciously change the way they act in different environments, desiring varying levels of personal control, highlights the ecological aspect of this model. Abery and colleagues state

self-determination can be conceived as a by-product of an ongoing interaction between individuals and the environments within which they function. It is influenced by personal characteristics as well as the environments in which one lives and develops, including the family, school, peer group, and community (1995, p. 171)

Therefore there are many factors other than the skills one possesses which influence self-determined behavior.

Abery (1994) identified four distinct factors which influence self-determined behavior: skills, knowledge, motivation, and environmental elements. This ecological perspective emphasized that simply learning self-determination skills in one environment was of little use if the skills could not be used on a regular basis to enhance personal control in a variety of environments (Abery et al., 1995). In order for a person to effectively take control of his or her life he or she must develop strengths in three areas, skills, knowledge, and motivation. Similar to Wehmeyer's model a set of skills critical for an individual to act in a self-determined manner was identified, these included goal-setting, choice-making, self-regulation, problem-solving, and personal advocacy skills. Knowledge developed as each individual came to know in which environments he or she wanted to have personal control; this may also be termed self-awareness. Motivation evolved through self-esteem and self-efficacy. Elements of different environments such as inclusion, respect, acceptance, support, positive reinforcement, and opportunities for choice and control interact with an individual's skills, knowledge, and motivation to facilitate or inhibit self-determined behavior (Abery et al.).

Abery and Stancliffe (2003) refined the concept of ecological self-determination and published the Tripartite Ecological Theory and model. For the purpose of this theory self-determination was defined as “individuals exercising the degree of control they desire over those areas of life they consider important” (Abery & Stancliffe, p. 43). Three elements are identified in the definition: degree of control desired, degree of control exercised, and importance. Abery and Stancliffe posit that if there is a high level of concordance between control exercised and control desired in areas of life that are important to a person, then the person possesses a high level of self-determination. Therefore, if a person desires to have total control in an important decision, and they are able to do this, they have a high degree of self-determination. Likewise, if a person is in a situation in which they do not want control, believe it is not important, and are able to behave in a manner which is similar to a by-stander, they also have a high degree of self-determination. This is a familiar scenario in everyone’s life, for instance, a couple is in the process of ordering a new car, one partner really wants an automatic transmission, the other prefers a manual; one person prefers a red car, the other really likes the metallic blue color. Discussion ensues and a decision is made to purchase a blue car with an automatic transmission, both parties feel satisfied, each has acted in a self-determined manner. Abery and Stancliffe suggest that “due to various constraints, the level of control most individuals exercise over their lives typically fall around the middle of the personal control continuum” (p.45). This may be substantially less for individuals with intellectual disabilities. A positive factor of this model is the recognition of the possibility of shared control in an environment. In the process of teaching self-determination the rate and extent of transfer of control of the environment may be determined by the learner, so that the learner may be acting in a self-determined manner in accordance to their preference.

The Tripartite Ecological Model of Self-Determination is based on two interrelated factors: the internal attributes or personal capacities of an individual and the extent to which environments are capable of, and committed to, supporting the exercise of self-determination (Abery & Stancliffe, 2003). The model breaks down the three areas of personal capacities associated with self-determination: skills, attitudes, and knowledge into component elements. Eight skill areas are identified as important to possessing the skills necessary to act in a self-determined manner: goal-setting, decision-making, self-regulation, problem-solving, personal advocacy, communication capacities, social skills, and independent living abilities. The personal capacity of attitudes, or one's belief system, is shaped by a person's locus of control orientation and attributions of success and failure, self-efficacy, self-esteem, feeling valued by others, and a positive outlook on life. Knowledge supportive of self-determination includes knowing about resources, laws, rights and options available, as well as self-knowledge. Development in all areas can be enhanced by supportive environments; in addition, as each area develops other areas are positively influenced. This model has direct implications for educational strategies.

Conclusion

Focusing on more than teaching skills may be beneficial for the development of self-determination. Effective use of skills is critical but building a solid knowledge base and positive attitude is also essential. The three studies that make up this dissertation are based on self-determination theory. The first study used Wehmeyer's work in the 1990's and incorporated one self-determination skill in an instructional strategy designed to promote sustained physical activity for three adolescents with autism. Self-determined learning theory and the Self-Determined Learning Model of Instruction (Wehmeyer, Agran, Palmer, Martin,

& Mithaug, 2003) shaped the second study. Goal-setting was added to the instructional strategy, so that the participants set goals and self-monitored during a physical activity. It was inferred from the results that the participants had difficulty setting goals, thus targeting knowledge and attitudes which support goal setting seemed a logical step for the next study. Abery and Stancliffe's Tripartite Ecological Theory guided study 3. The theories are complimentary and used together provided several vantage points from which to view self-determined behavior. The challenge was to find the best strategy, using self-determination skills, which would actively engage students with autism in 30 minutes of physical activity.

References

- Abery, B. (1994). A conceptual framework for enhancing self-determination. In M. Hayden & B. Abery (Eds), *Challenges for a service system in transition* (pp.345-380). Baltimore:Brooks.
- Abery, B., Rudred, L., Arndt, K., Schauben, L. & Eggebeen, A. (1995). Evaluating a multicomponent program for enhancing the self-determination of youth with disabilities. *Intervention in School and Clinic*, 30, 170-179.
- Abery, B. & Stancliffe, R. (2003). A tripartite ecological theory of self-determination. In M. Wehmeyer, B. Abery, D. Mithaug, & R. Stancliffe (Eds.), *Theory in self-determination: Foundations for educational practice* (pp. 43-78). Springfield, Ill: Charles C Thomas.
- Agran, M., Blanchard, C., & Wehmeyer, M. (2000). Promoting transition goals and self-determination through student self-directed learning: The self-determined learning model of instruction. *Education and Training in Mental Retardation and Developmental Disabilities*, 35, 351-364.
- Agran, M., & Wehmeyer, M.L. (2006). Child self-regulation. In M. Hersen (Ed.) *Clinician's handbook of child behavioral assessment* (pp. 181-199). New York: Academic Press
- Algozzine, B., Browder, D., Karvonen, M., Test, D., & Wood, W. (2001). Effects of interventions to promote self-determination for individuals with disabilities. *Review of Educational Research*, 71, 219-277.
- Angyal, A. (1958). *Foundations for a Science of Personality*. Cambridge, MA: Harvard University Press.
- Bandura, A. (1997). *Self-Efficacy: The Exercise of Control*. New York: W.H. Freeman & Co.

- Deci, E.L., & Ryan, R.M. (1985). *Intrinsic Motivation and Self-Determination in Human Behavior*. New York: Plenum.
- Fullerton, A., & Coyne, P. (1999). Developing skills and concepts for self-determination in young adults with autism. *Focus on Autism and Other Developmental Disabilities*, 14, 42-52.
- Ganz, J., & Sigafoos, J. (2005). Self-monitoring: Are young adults with MR and Autism able to utilize cognitive strategies independently? *Education and Training in Developmental Disabilities*, 40, 24-33.
- Geisler, N.L.. (1998) Overcoming objection for hard determinism. In N. L. Geisler, *Baker encyclopedia of Christian apologetics*. Grand Rapids, MI: Baker Book House Co.
- Hatton, C., Emerson, E., Robertson, J., Bregory, N., Kessissoglou, S., & Walsh, P. (2004). The resident choice scale: a measure to assess opportunities for self-determination in residential settings. *Journal of Intellectual Disability Research*, 48, 103-113.
- Hobbes, T. (1991). Excerpts from Leviathan, Liberty and Necessity. In T. Honderich (Ed). The determinism and free will website. Retrieved March 5, 2007 from University College London Web site: <http://www.ucl.ac.uk/~uctytho/dfwVariousHobbes.htm> (Original work published in 1651)
- King-Sears, M. (1999). Teacher and researcher co-design self-management content for an inclusive setting: Research training, intervention, and generalization effects on student performance. *Education and Training in Developmental Disabilities*, 34, 134-156.
- Locke, J. (1979). *An Essay Concerning Human Understanding*. New York: Oxford University Press. (Original work published 1690)
- Myers, D. (2001). *Psychology* (6th Edition). Detroit, MI: Worth Publishers.

- Mallette, P., Mirenda, O., Jones, P., Bunz, T., & Rogow, S. (1992). Application of a lifestyle development process for people with severe intellectual disabilities: A case study report. *Journal of the Association for Persons with Severe Handicaps*, 17, 179-191.
- Miner, C., & Bates, P. (1997). The effects of person centered planning activities on the IEP/transition planning process. *Education and Training in Mental Retardation and Developmental Disabilities*, 32, 105-112.
- Mithaug, D., Mithaug, D., Agran, M., Martin J., & Wehmeyer, M.L. (2003). *Self-Determined Learning Theory Construction, Verification, and Evaluation*. Hillsdale, NJ: Erlbaum.
- Nije, B. (1972). The right to self-determination. In W. Wolfensberger (Ed.), *Normalization: The principle of normalization* (pp. 176-200). Toronto, ON: National Institute on Mental Retardation.
- Shorter Oxford English Dictionary on Historical Perspectives*. (1967). London, GB: Clarendon Press.
- Test, D., Fowler, W., Brewer, C.H., & Wood, W. M. (2005). A content and methodological review of self-advocacy intervention studies. *Exceptional Children*. 72, 101-125.
- Todd, T., & Reid, G. (2006). Increasing physical activity in individuals with autism. *Focus on Autism and Other Developmental Disabilities*, 21, 167-176.
- Wehmeyer, M. L. (1992). Self-determination and the education of students with mental retardation. *Education and Training in Mental Retardation*, 27, 303-314.
- Wehmeyer, M. L. (1994). Perceptions of self-determination and psychological empowerment of adolescents with mental retardation. *Education and Training in Mental Retardation and Developmental Disabilities*, 29, 9-21.

- Wehmeyer, M. L. (1998). Self-determination and individuals with significant disabilities: Examining meanings and misinterpretations. *Journal of the Association for Persons with Severe Handicaps*, 23, 5-16.
- Wehmeyer, M. (2003a). Self-determination: A review of the construct. In M. Wehmeyer, B. Abery, D. Mithaug, & R. Stancliffe (Eds.), *Theory in self-determination: Foundations for educational practice* (pp. 5-24). Springfield, Ill: Charles C Thomas.
- Wehmeyer, M. (2003b). A functional theory of self-determination: Definition and categorization. In M. Wehmeyer, B. Abery, D. Mithaug, & R. Stancliffe (Eds.), *Theory in self-determination: Foundations for educational practice* (pp. 174-181). Springfield, Ill: Charles C Thomas.
- Wehmeyer, M. (2003c). Research to practice: Implications of the functional theory. In M. Wehmeyer, B. Abery, D. Mithaug, & R. Stancliffe (Eds.), *Theory in self-determination: Foundations for educational practice* (pp. 261-282). Springfield, Ill: Charles C Thomas.
- Wehmeyer, M. (2005). Self-determination and individuals with severe disabilities: Re-examining meanings and misinterpretations. *Research and Practice for Persons with Severe Disabilities*, 30, 113-120.
- Wehmeyer, M.L., Agran, M., & Hughes, C. (2000). A national survey on teachers' promotion of self-determination and student-directed learning. *The Journal of Special Education*, 34, 58-68.
- Wehmeyer, M., Agran, M., Palmer, S., Martin, J. & Mithaug, D. (2003). The effects of problem-solving instruction on the self-determined learning of secondary students with disabilities. In D. Mithaug, D. Mithaug, M. Agran, J. Martin, & M. Wehmeyer

- (Eds.), *Self-determined learning theory construction, verification, and evaluation* (pp. 158-171). Hillsdale, NJ: Erlbaum.
- Wehmeyer, M.L., & Garner, N.W. (2003). The impact of personal characteristics of people with intellectual and developmental disability on self-determination and autonomous functioning. *Journal of Applied Research in Intellectual Disabilities*, 16, 255-265.
- Wehmeyer, M.L., Kelchner, K., & Richards, S. (1996). Essential characteristics of self-determined behaviors of adults with mental retardation and developmental disabilities. *American Journal on Mental Retardation*, 100, 632-642.
- Wemeyer, M., & Metzler, C. (1995). How self-determined are people with mental retardation? The national consumer survey. *Mental Retardation*, 33, 111-119.
- Wolfensberger, W. (1972). *Normalization: The principle of normalization*. Toronto, ON: National Institute on Mental Retardation.

Bridging Manuscripts and Author Contribution

The objective of this doctoral dissertation was to design and assess the effectiveness of interventions which promote sustained physical activity for individuals with autism spectrum disorder (ASD), particularly those on the severe end of the spectrum. The first chapter described the emergence of self-determination as an educational construct and outlined current educational model. Chapter two moves away from a theoretical view of self-determination and towards a practical application. This chapter is a study designed on the principle of self-determination theory for the purpose of promoting sustained activity during a snowshoe, walk, and jog program. Originally designed as a pilot study to test the applicability of self-determination skills during physical activity, the positive results prompted us to publish this study and include it as part of the dissertation. The relative contributions of the two authors is as follows. As first author and primary researcher I was responsible for 85% of the manuscript, I was involved in the research design, and I carried out program implementation, data collection, data analyses, and manuscript writing. Dr. Reid was responsible for the remaining 15%, he participated in the design of the study, consulted on the analysis of the data, and edited the manuscript.

Chapter 2

Increasing physical activity in individuals with autism

From T. Todd and G. Reid, 2006, *Focus on Autism and Other Developmental Disabilities* 21, 167-176. © 2006 by Pro-ed Publishers. Reprinted with permission from pro-ed (Austin, Texas).

Abstract

This study investigated the outcomes of an intervention package on participation in two physical activities: snowshoeing and walking/jogging. Three male secondary school students diagnosed with autism attending a school for students with intellectual disabilities participated in a six-month outdoor physical activity program. A changing conditions design was used; the program divided into six phases by the amount of edible reinforcers provided during sessions. A self-monitoring board, verbal cuing, and edible reinforcers were used in the study. Distance snowshoed, walked and jogged per 30 minute session increased as edible and verbal reinforcement decreased. The study suggests that interventions can be developed to promote sustained participation in physical activity for individuals with autism.

Increasing physical activity in individuals with autism

Physical activity is an important part of a healthy lifestyle for all people (U.S. Department of Health and Human Services, 1996), but is often overlooked in people with severe disabilities (Ellis, Cress, & Spellman, 1992) including those with autism spectrum disorder (ASD). Motor functioning of individuals with autism spectrum disorder has been a neglected area (Baranek, 2002; National Research Council, 2001) despite the fact that participation in physical activity has been shown to have multiple benefits including reduction of stereotypic behavior (Levinson & Reid, 1993; Prupas & Reid, 2001), increased appropriate responding (Kern et al., 1998), and potential for social interaction (Berkeley, Zittel, Pitney, & Nichols, 2001). The diagnosis of ASD is increasing (Wing & Potter, 2002) and many teachers and coaches are, or soon will be, including children with ASD in their programs. Therefore, empirical research which validates instructional methods and establishes programming guidelines to enhance physical activity participation is needed.

Motor functioning is becoming increasingly recognized as a deficit area for children with ASD. Parents have noted motor delays in infants with ASD as early as six to nine months (Baranek, 1999; Ornitz, Guthrie, & Farley, 1977). Performance of children with autism on standardized motor tests tends to fall below average. Berkeley et al. (2001) examined the locomotor and object control skills of children 6 – 8 years of age with autism. Seventy-three percent of the participants scored in the poor and very poor performance categories of the Test of Gross Motor Development (Ulrich, 1985). Ghaziuddin and Butler (1998) reported that children 8 – 15 years of age diagnosed with autism scored lower on the Bruininks-Oseretsky Test of Motor Proficiency than peers diagnosed with Asperger syndrome and pervasive developmental disorder- not otherwise specified (PDD-NOS). All three groups

scored lower than general population norms. IQ scores for the three groups were reported with the autism and PDD-NOS groups having a mean full-scale IQ of 78 and the Asperger group 105; when the gross motor test scores were adjusted for IQ there was no significant difference between the three groups. This suggests that intellectual function may have an impact on motor performance. Manjiviona and Prior (1995) found that children with high functioning autism scored lower on motor skills than children with Asperger Syndrome, although both groups performed below age appropriate norms. Thus it seems that the available evidence converges on a conclusion of poor motor functioning associated with ASD, particularly for those with autism (Baranek, 2002; Smith, 2000; Reid & Collier, 2002). Participation in physical activity is often a challenge for people with autism due to poor motor functioning, as well as low motivation (Koegel, Koegel, & McNeerney, 2001; Reid, O'Connor, & Lloyd, 2003), difficulty in planning and generalization (Ozonoff, Strayer, McMahon, & Filloux, 1994; Renner, Klinger, & Klinger, 2000), and difficulty self-monitoring (Hughes, Russel, & Robbins, 1994). Promoting physical activity with complex motor skills (e.g. golfing, soccer) is likely to be problematic. In addition, team activities may be contraindicated for some individuals due to social interaction and physical skill requirements. Therefore physical activities which do not require high skill levels, and/or team environments, may be more appealing to individuals with autism.

Sedentary lifestyles are commonplace for individuals with intellectual disabilities (Draheim, Williams, & McCubbin, 2002), and fitness levels for this population have been found to be lower than for the general population (Ellis et al., 1992; Gillespie, 2003). Few studies report fitness levels of adolescents and adults with severe autism. Yet the majority of individuals with autism also have an intellectual disability (Fombonne, 2003) and therefore

one would expect low fitness and activity levels of this population also. Programs which utilize simple motor activities and encourage sustained participation should be investigated. The Surgeon General's Report on Physical Activity and Health (U.S. Department of Health and Human Services, 1996) suggests that 30 minutes of moderate to vigorous physical activity is necessary to acquire substantial health benefits. However, encouraging individuals with autism to be physically active for 30 minutes at a moderate level may prove challenging.

Strategies which combine external reinforcement, self-monitoring, and verbal cuing from adults may be effective for encouraging sustained engagement in physical activity for people with autism. External reinforcers may motivate students to initially participate in an activity and may then be replaced by internal operants to promote independence (Firman, Beare, & Loyd, 2002; Hughes et al., 2002). Self-monitoring refers to the systematic observation of one's behavior and recording the occurrence or nonoccurrence of a specific response in some way. Two actions occur in the process of self-monitoring: self-observation and self-recording. Self-monitoring promotes independence and increases participation, but is seldom taught and followed in educational programs (Agran et al., 2005; Hughes et al., 2002), and is rarely used in physical education. Much of the existing research on self-monitoring focuses on typically developing students and those with mild disabilities. Lombard, Lombard, and Winett (1995) and Weber and Wernheim (1989) found that self-monitoring in conjunction with prompting, and extra attention, was effective in increasing participation in exercise programs for individuals without disabilities over a 4 to 6 month period. However, there is an absence of research on self-monitoring for students with autism and severe intellectual disabilities (Ganz & Sigafos, 2005), though this strategy has the potential to increase student participation in educational settings (Agran et al., 2005). However, Agran,

Snow, and Swaner (1999) found that only 35% of special education teachers surveyed taught self-monitoring skills while far fewer, only 3%, reported observing their students using these skills. Research on the use of self-monitoring strategies in the area of physical activity for people with autism is extremely limited; investigation is required to determine if self-monitoring will increase student participation.

Teaching and encouraging self-monitoring of an exercise program may be one method of promoting a physically active lifestyle for individuals with autism. The purpose of this project was to investigate the impact of an intervention program which included edible reinforcement, verbal cueing, and self-monitoring on sustained physical activity of adolescents and a young adult with autism.

Method

Participants

Three male students from a school for individuals with severe disabilities participated in a snow shoeing, walking and jogging program. They ranged in age from 15 to 20 years. Each had a primary diagnosis of autism, was non-verbal, and engaged in a high degree of stereotypic behaviors. Participants were recommended by the school director on the basis of three criteria: (a) the participant's ability to perform the physical activity, including going outside during the winter, (b) the classroom teacher's belief that the student would benefit equally from the physical activity as a classroom activity, and (c) parental consent. There was no formal physical education program in this school. Four students were initially recruited. One student removed his boots and socks when he arrived at the park. Due to safety concerns, including fear of frostbite, he did not participate in the physical activity program.

Each of the three individuals who participated was diagnosed as having autism conforming to DSM-IV-TR (American Psychiatric Association, 2000) guidelines and were categorized by the "Guide de la declaration d'effectif scolaire des jeunes en formation generale (DCS)" (Ministère de l'Education, 1996) under this disorder. The DCS is a Quebec provincial government document which categorizes disabilities into codes to facilitate educational services. The code for autism is given to participants who meet DSM IV criteria for autism as diagnosed by a psychiatrist in conjunction with a multi-disciplinary team. Though specific details of the participants' cognitive abilities were not available, all young men attended a school for students with intellectual disabilities. Therefore, all participants were considered to have autism and intellectual disability.

The three participants were in two classrooms within the school. Each class used a structured teaching approach based on the TEACCH program (Schopler, 1994). The participants received edible reinforcement and verbal cueing in the classroom on a similar basis as used in this study, but were not familiar with self-monitoring systems. Tom was 16 years of age. He was generally happy, enjoyed outdoor activities, and engaged in a high degree of stereotypic behaviors such as hand flapping, swallowing air, running water over his hands and face, and vocalizations (high pitch humming). Tom self-mutilated by scratching his face, hands, and lower arms until they bled. Tom was able to follow the classroom schedule and work independently if the work material was organized. He was non-verbal and used pictograms efficiently to communicate his needs.

Mike was 20 years old. He was engaged in a number of stereotypic behaviors which interfered with other activities including: hand flapping and finger movements, echolalia and yelling, ripping plastic bags, pacing, walking in a particular pattern, and throwing items.

Mike's parents and classroom personnel reported that Mike was often anxious, this was overtly seen by an increase in the following behaviors: pacing, ripping plastic bags, throwing items, opening and closing his fists, and pushing other people. His anxiety was also reflected in physical appearance changes, notably his eyes were wide open, facial muscles were tense, and his rate of breathing increased and was audible. Though echolalic, he did not use words in a functional manner, he communicated with the use of pictograms while in school. Mike was in good physical condition and enjoyed being outside.

Robert was 15 years old with multiple disabilities including autism, intellectual disability and congenital fibre-type disproportion (CFTD). CFTD is a physical disability characterized, in part, by congenital hypotonia, respiratory difficulties, skeletal deformities, and delayed motor milestones (ter Laak et al., 1981). Robert displayed several stereotypic behaviors on a regular basis: hand flapping, head banging and rolling, and self-hitting. Robert also displayed aggressive behaviors such as slapping, pinching and kicking others. It was reported by parents and classroom personnel that Robert was often anxious, this was characterized by withdrawal from the physical presence of others, increased rocking, self-hitting and head-banging, as well as increased striking of staff. At the same time it was reported that there were audible respirations and lack of eye contact. Robert enjoyed being outside, especially once the weather was warm. He was non-verbal, could follow a schedule quite well, and was becoming adept at communicating with the use of pictograms.

Activity

Two culturally normative activities which were weather dependent were carried out at a local park: snowshoeing and walking/jogging. Snowshoeing was the first part of the program, lasting 9 sessions, and was followed by walking/jogging for 23 sessions. The

activities were performed outdoors and reflected seasonal changes. Snowshoeing occurred from January until March. Snowshoeing is a common activity in Canada and is a fun way to exercise outdoors in the snowy winter months. Also, snowshoeing on a flat area (such as a soccer field) is a low skill activity. In addition to physical exercise it was felt participants would benefit from learning an activity which is readily available, inexpensive, and could be done outside of school. The activity was new for the participants and verbal support was required during the snowshoeing sessions. It should be noted that, due to safety reasons, sessions were cancelled when outdoor temperatures fell below -18 degrees Celsius (-0.4 F) or when the field was icy due to freezing rain. Eight snowshoeing sessions were cancelled, leaving a total of 9 opportunities to snowshoe.

The program changed to walking and jogging when the snow melted. The walking program began in late March and continued until the end of the school year; in the same park and on the same circuit as snowshoeing. Walking and jogging are activities which are low skill, require little equipment, and can be engaged in almost anywhere, thus encouraging an active lifestyle. The walking/jogging activity occurred inside the school on rainy days.

Activity circuit. The circuit was diamond shaped (57 m x 50 m) within the boundaries of a standard soccer field. The start/finish point of the circuit was a permanent bench mid-way along one side of the soccer field. The self-monitoring board was placed on the bench. The remainder of the circuit was marked by three flag poles (1.1 m high) with 4 flags each: yellow, green, red, and blue. One flag pole was placed opposite the start/finish point on the other side of the soccer field, and one flag pole was placed in front of the goal at each end of the field.

The activity took place twice a week at the park when weather was cooperative and inside the school on three rainy days (sessions 18, 23, and 24). When the activity took place

inside, the self-monitoring board and the three flag poles were set in each corner of the school physical activity area. Each circuit was 53 m, approximately one quarter of the total circuit distance at the park. Therefore four indoor circuits equaled one outdoor circuit. Participants followed the indoor circuit easily.

On three occasions the soccer field was not available so the circuit was set up in an alternative area of the park. The self-monitoring board and flags marked the circuit. The flags were set 54 m apart and the circuit equaled the distance covered in one circuit of the soccer field. Therefore distance was recorded in the same manner as when using the circuit in the soccer field. Participants initially required additional verbal directives to follow the circuit, but became more independent with time.

Intervention

The intervention consisted of three main components: self-monitoring board, edible reinforcement, and verbal encouragement/directions. Each are described separately.

Self-monitoring board. The participants recorded each completed circuit by placing a 7.6 cm diameter happy face on a rigid foam board under their name as seen in Figure 1. The markers and self-monitoring board were designed using the colors assigned each participant in their TEACCH-based classroom. The rigid foam board measured 50.8 by 76.2 cm. The recording board was divided into three vertical sections, one for each participant whose name was written at the top in the participant's color. Participants placed one happy face marker per completed circuit under their names, coordinating the color with the color in which the name was written.

To accommodate for the smaller space on the days that the activity took place in the school physical activity area, an intermediate recording board was created. Small (10 cm x 30

cm) individual laminated self-monitoring cards with four Velcro dots were designed for the indoor program. Students placed one happy face marker per completed circuit on the individual board, when the board had four happy face markers they were removed and one happy face marker was placed on the larger self-monitoring board used at the park and soccer field.

Edible reinforcement. Participants were given edibles they preferred (gummie bears, chips, and gum balls) as recommended by the classroom teacher, during the physical activity program. This was consistent with classroom practices. Following four baseline sessions during which no edible reinforcement was given, reinforcers were provided every quarter circuit for four sessions, that is, one edible as each participant reached each corner on the diamond circuit. The reinforcers were provided on a decreasing basis during the program at a rate of one every four sessions until one reinforcer per complete circuit was reached. At this point participants continued to receive one reinforcer when they placed their happy face marker on the self-monitoring board. This protocol was followed for the remainder of the program until the final four sessions, during which no edible reinforcement was offered. The use of edible reinforcers such as candy, may appear contraindicated in the quest for an active lifestyle. The use of candy in this program was requested by school personnel so that there would be continuity between the school program and the physical activity program. Since the activity was carried out during school hours it was deemed important to cooperate with the school personnel.

Verbal Cueing. Verbal cueing, in the form of encouragement and direction, were provided to participants by staff who accompanied them during the physical activity program. Verbal cueing was not systematically manipulated but varied at the discretion of the

researcher or teaching assistant accompanying the participants during the program. Verbal encouragement was defined as statements which were intended to provide motivation to continue exercising such as: 'Good job', 'Bravo', and 'You are a champion'. Staff members were asked to give encouragement during the circuit if the participants slowed down or stopped moving. Verbal encouragement was also given to increase participant's pace, and to congratulate them on a completed circuit. Verbal directives were defined as statements used to direct participants around the circuit and to re-direct them if they wandered out of the circuit, or forgot to touch a flagpole. Staff members wore portable microphones every third session which recorded the verbal encouragement and directives. Event recording (van der Mars, 1989), in which each verbal directive or statement of encouragement is recorded as a single event, was used to count the number of events per session.

Procedure

The program was carried out Tuesday and Friday afternoons. Each session lasted one hour and was scheduled into the participants' weekly schedule. The first 15 minutes consisted of dressing in outdoor clothing and walking to the park which was located 0.45 km from the school. The actual snowshoeing or walking/jogging program occurred for 30 minutes. The final 15 minutes of the hour consisted of walking back to the school and putting away outdoor clothing and equipment. On the three occasions when the activity was conducted inside the school the participants came to the physical activity area, walked and jogged for thirty minutes, then returned to their classrooms.

The researcher and two classroom teaching assistants accompanied the participants to the park. Upon reaching the park the researcher asked the participants to begin the exercise activity, usually by saying "Let's go! How many circuits can we do today?". The participants

snowshoed, walked or jogged around the circuit touching each flag pole as they completed each section. The researcher and teaching assistants moved around the circuit, providing assistance and encouragement if needed. The participants recorded each completed circuit by placing a happy face marker on their self-monitoring board.

Instruction on snowshoeing was provided to participants prior to the beginning of the program. Participants were invited to snowshoe in the school yard four times before the program began. The researcher helped the participants put on the snowshoes and adjusted the harnesses to fit each individual's boots. In addition the researcher or school staff helping with the program ensured the harnesses were fastened correctly. The participants were instructed to stand up on the snowshoes, the researcher then stood in front of the participants holding both their hands, and encouraged each person to take large steps. As the participant was able to maintain his balance while walking with snowshoes the researcher moved to his side, holding one hand for balance if required. By the end of four sessions all participants were able to walk on snowshoes independently though they required assistance to stand up if they fell.

The use of the self-monitoring board was new to all the participants. The board was introduced on Session 5. At the beginning of the session the researcher showed the board to the participants and showed them how to place a happy face marker under their name each time they passed the start/finish point. The primary researcher greeted each participant as they approached the start/finish point, gave them a happy face marker of the correct colour, directed them to the self-monitoring board, and hand over hand put the marker on the board. This procedure was carried out for three sessions, after which the participants usually put the marker on the board independently. Throughout the program one school staff or the researcher would remain near the self-monitoring board, give each student a coloured happy

face marker as he approached, and provide prompting as required in order to accomplish placement on the board.

Design

A changing conditions design was used to judge the effectiveness of the intervention package during physical activity (Alberto & Troutman, 2006). Conditions were predetermined (Kennedy, 2005). The program was divided into three conditions, (A) baseline, (B) self-monitoring and verbal cuing plus edible reinforcers, and (C) self-monitoring and verbal cuing of the physical activity without edible reinforcers. The second condition which included the edible reinforcers was divided into four phases characterized by decreasing edible reinforcers from four per circuit (sessions 5 – 9), to three per circuit (sessions 10 – 13), two per circuit (sessions 14 – 17) and one per circuit until participants entered into the third condition. In the final condition, participants continued self-monitoring and receiving adult cuing but did not receive edible reinforcers. Tom completed four sessions in the final condition while Robert and Mike participated in only three sessions since they were away one day for a field trip. Changing conditions designs allow the effects of several interventions to be investigated. This design can also be used to examine the effects of fading reinforcement as seen in phase B. Although functional relationships cannot be established without replication of each intervention, the effects of various interventions on behavior can be documented (Alberto & Troutman). This type of design has been used in research with students with disabilities (Stafford, Alberto, Fredrick, Heflin, & Heller, 2002).

Data Collection and Interobserver Agreement

The number of circuits completed by each participant was recorded by the researcher at the end of each session, based on the number of smiley faces that had been placed on the

self-monitoring board. Students were encouraged to finish a circuit once it was begun, so no fractional circuit data occurred. Since adults were monitoring students' completion of the activity circuit, additional reliability data were not collected. To determine the reliability of the data collected on the adults' verbal cuing, interobserver agreement was calculated (Kennedy, 2005). Statements were classified as consisting of encouragement or directions. A second rater listened to 38% of the audio recordings. Reliability was 97% for verbal encouragement and 93% for verbal directives.

Results

Participants snowshoed for nine sessions, four during baseline (A), four under condition B phase one (four reinforcers per circuit), and one session in phase two. Number of circuits completed increased for all participants. Walking and jogging began on session 10 and continued through session 28. All participants increased the distance walked/jogged over the course of the program. Walking/jogging began in condition B phase two, three reinforcers per circuit, and continued through phases three and four, and condition C.

Figure 2 shows distance snowshoed/walked/jogged by Tom. Snowshoeing distance increased by 0.2 Km over nine sessions. The distance Tom walked/jogged increased from 0.84 Km to 2.1 Km, an increase of 1.2 Km over 21 sessions while edible reinforcers decreased.

Mike increased the distance he snowshoed by 0.2 Km over the first nine sessions. He doubled the distance walked/jogged from 1.14 to 2.3 Km, an increase of 1.14 Km over the remaining 17 sessions. Figure 3 displays a systematic decrease in edible reinforcers with a substantial increase of distance walked/jogged by Mike.

Figure 4 displays the number of circuits snowshoed and walked by Robert. Snowshoe distance doubled over the first nine sessions, moving from an average of 200 m completed per baseline session to 400 m during Condition B phase one, four edible reinforcers. Distance walked increased from 414 m to 1242 m in 30 minutes over the following 16 sessions. Robert achieved less overall distance than the other two participants, likely due to a mild physical disability, but nonetheless increased the distance consistently over the course of the program. Robert also missed several sessions in Phase B4 due to illness.

Verbal Cuing

The frequency of verbal encouragement and directives decreased over the duration of the program as shown in Figure 5. Verbal data were collected during 18 sessions throughout the program. At session 7 both verbal directives and encouragement decreased dramatically after snowshoeing. This is likely due to the type of activity, as previously noted snowshoeing was a new activity during which staff gave participants much guidance and encouragement. In addition, the participants were learning to negotiate the circuit during the snowshoeing activity and this may have resulted in more verbal directives. Verbal encouragement continued to decrease more slowly over the walking/jogging program. However, session 11 was very high in verbal encouragement due to the commencement of jogging during the session. Distance walked/jogged during the sessions continued to increase despite the reduction in verbal encouragement.

Verbal directives remained fairly stable, with a slight decline throughout the walking/jogging program. A peak in the number of directives is evident in sessions 9, 10 and 17; these sessions took place in a different area of the park due to conflicts with a local elementary school physical education class.

Discussion

This study demonstrated that an instructional strategy which included self-monitoring, verbal cuing, and edible reinforcers was associated with increased sustained participation in a snowshoe/walk/jog program. Participants in the present study engaged in 30 minutes of physical activity twice per week, at an individual determined pace. Physical inactivity of adults with intellectual disabilities which results in associated health risks has been well documented (Draheim et al., 2002). Stanish (2004) found that walking is an activity in which adults with intellectual disabilities engage. Walk/run activities require little equipment, and can be carried out in local parks. Also children with autism often have poorer motor skills than children without disabilities (Berkeley et al., 2001); therefore programs which do not require high skill and can incorporate individuals of different skill levels are beneficial in educational settings. For instance, in the present program Robert was not able to jog continuously while his two peers jogged a majority of the 30 minutes towards the end of the program, yet all were able to attend the same exercise program.

Individuals with autism often lack the motivation to exercise for sustained periods which is necessary to reap health benefits associated with physical activity. Continuous moderate exercise for 30 minutes is beneficial to one's cardiovascular fitness, an important health factor (U.S. Department of Health and Human Services, 1996). Intensity of exercise determined by distance covered in the 30 minute time period, increased during the program, and came close to meeting the Surgeon General's suggestion of moderate or brisk walking at a minimum rate of 4.8 kmph (U.S. Department of Health and Human Services, 1999). Tom and Mike completed 2.1 and 2.3 km in 30 minutes towards the end of the program, a walking rate of 4.2 and 4.6 kmph respectively. In addition, the activity was carried out over a six

month period, while the edible reinforcers and verbal cuing provided by adults decreased. Future research should explore physical fitness and health related changes which may accompany sustained physical activity.

The self-monitoring board was created to enable participants to record the number of circuits completed during each exercise session. Participants were taught to use the recording device during the exercise program. Self-monitoring has been identified as an important skill and may be considered a component of pivotal behavior (Koegel, Koegel, & Carter, 1999). Purportedly, pivotal behaviors generalize across settings, increase independence, and decrease problem behavior. The participants did become increasingly independent as the activity progressed through the school year, and were able to generalize the activity in two different settings: indoors and an alternative circuit in the park when the soccer field was in use by a local elementary school. The students understood the concept of recording each completed circuit, which was marked by the flags, regardless of the location.

The self-monitoring board acted as a record keeping device during the physical activity, this was similar to devices commonly used for token economy systems. However, the smiley faces were not exchanged for reinforcers; rather the reinforcers were provided upon the completion of a pre-determined distance. For example, in B1, participants placed a smiley face on the board and received an edible for each completed circuit. Although the smiley face continued to be placed on the board for each completed circuit, the edibles were faded until none were given. Therefore, the smiley faces were not exchanged for backup reinforcers as in a token economy system but were used for the purpose of self-recording only. An interesting topic for future research is the role of the self-monitoring board for motivating continued physical exercise. The three youth in this study were motivated to engage in physical exercise,

but their reasons are unknown. Initially, they may have been motivated to complete each section of the circuit in order to gain an edible reinforcer. However, as the edibles were faded, the behaviour continued and the number of circuits completed increased. The adults' presence and use of verbal cuing may have been sufficient to perpetuate the activity. It is also not clear if increases in the number of smiley faces was motivational or if the distance walked/jogged would have increased within the time allotted even without the placement of smiley faces for completed circuits. The use of a changing conditions design without alternating conditions does not allow the determination of functional relationships unless additional comparisons are incorporated. Future investigation using a research design would provide more information on the efficacy of each intervention.

The distance walked/jogged was not affected when edible reinforcers were completely removed during the final baseline sessions, actual distance remained the same as, or exceeded, the prior four sessions. One contributing factor may be that self-monitoring led to some degree of internal motivation. Deci and Ryan (2000) describe an external to internal motivation continuum on which individuals can move. People may initially participate in activities in response to external motivators. In time, internal motivators may replace the primary external motivators. Internal motivation is preferred to complete reliance on external motivators; thus developing some degree of intrinsic motivation is a positive step toward increasing sustained participation in physical activity. The current data are consistent with the notion of participants moving toward more intrinsic motivation as the program progressed.

Traditional external control, edible reinforcers and verbal cuing, decreased during the six-month program. Edible reinforcers decreased on a predetermined fashion while the verbal cuing decreased naturally. Staff members were not given any directives to decrease verbal

interactions with participants, though participant independence was encouraged by the researcher. As noted, several data points, one verbal encouragement (session 11, Figure 5) and three verbal directives (sessions 9, 10, & 17, Figure 5), were above the average value for that time period. The rise in verbal encouragement occurred during session 11 because Tom and Mike began to jog, which caused much excitement for students and staff. Though jogging continued for the remainder of the program, verbal encouragement returned to prior levels in the next session. The peak values in verbal directives occurred in three sessions held in alternative areas of the park on days when a local elementary school used the soccer field. While participants agreeably performed the activity in an alternative area, more directives were required. Though verbal directives were elevated they did decline from session 9 to 10 and were still lower in session 17; indicating the ease of generalizing this activity to different locations. This is consistent with Koegel et al.'s (1999, 2001) definition of pivotal behaviors; behaviors that generalize to different activities and settings. The use of the self-monitoring device and verbal cuing remained constant throughout the program and contributed to participation in sustained physical activity for these three young men with autism.

In addition to self-monitoring, each participant received regular attention and encouragement which may have been responsible for some increase in participation, consistent with results from previous research (Lombard et al., 1995; Weber & Wernheim, 1989). Therefore, one limitation of our study is the inability to ascertain which variable, or variables, was the prime mediator of performance. Collectively, self-monitoring, edible reinforcers, verbal cuing, extra attention, or even enhanced physical fitness itself may have contributed to the increased distance walked/jogged during the 30 minute sessions. Yet as physical activity increased throughout the program, verbal cuing and edible reinforcement

decreased. Self-monitoring was constant throughout the program and we believe an effective component of the exercise program. The self-monitoring intervention is: easy to design, portable, and simple to use, making it a practical intervention for teachers and physical educators. However, it would be premature to conclude that self-monitoring was the sole or primary component in the program. The use of a changing conditions design and use of an intervention package make it impossible to demonstrate a functional relationship between any of the individual components or combination package. Future research should be carried out using alternative designs, such as a changing conditions design with replication, so that functional relationships may be demonstrated (Alberto & Troutman, 2006).

A second limitation of this study is that baseline measurement, A and C, are not directly comparable. The first baseline was recorded during snowshoeing while the final baseline was walking/jogging. Snowshoeing is a slower activity that requires more effort than walking and jogging, so it is natural that less distance is covered in a 30 minute session. More snowshoeing sessions had been planned, twice a week from January through March, or as long as the snow lasted. We estimated this would be approximately 14 to 18 sessions. Unfortunately, excessively cold weather and ice forced the cancellation of the program on eight sessions interspersed throughout the winter months, therefore fewer snowshoeing sessions were completed than expected. It seemed that two options were available to the researchers when it became clear that only nine snowshoe sessions were possible; return to a baseline condition in the walking/jogging program and restart the edible reinforcement protocol, or continue decreasing the edible reinforcers and forego a baseline condition in the walking program. The second option was chosen because the effect of the self-monitoring and verbal cuing package was the focus of the study. It was reasoned that decreasing external

reinforcers as quickly as possible was a priority. Therefore the walking program continued from the snowshoeing program following the declining external reinforcement protocol. However, this decision prevented establishing a stable walking baseline, against which to compare the effect of the intervention during the walking and jogging program.

Despite the limitations, we have shown that as traditional edible reinforcers were eliminated and verbal cuing declined, distanced snowshoed, walked, and jogged increased. The use of the self-monitoring device remained constant throughout the program and may have contributed to participation in sustained physical activity for Tom, Mike, and Robert. In addition, this simple, inexpensive strategy can be easily used in physical activity settings by parents, teachers, and physical activity specialists to encourage sustained participation. It will be important that future research verify that self-monitoring is an important instructional strategy to increase sustained participation in physical activity for individuals with autism.

References

- Agran, M., Sinclair, T., Alper, S., Cavin, M., Wehmeyer, M., & Hughes, C. (2005). Using self-monitoring to increase following-direction skills of students with moderated to severe disabilities in general education. *Education and Training in Mental Retardation and Developmental Disorders*, 40, 3 -13.
- Agran, M., Snow, K., & Swaner, J. (1999). Teacher perceptions of self-determination: benefits, characteristics, strategies. *Education and Training in Mental Retardation and Developmental Disorders*, 34, 293 – 301.
- Alberto, P. & Troutman, A. (2006). *Applied behavior analysis for teachers* (7th ed.). New Jersey: Merrill Prentice Hall.
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed revised). Washington, DC: Author.
- Baranek, G. (1999). Autism during infancy: A retrospective video analysis of sensory-motor and social behaviors at 9 – 12 months of age. *Journal of Autism and Developmental Disorders*, 29, 213- 224.
- Baranek, G. (2002). Efficacy of sensory and motor interventions for children with autism. *Journal of Autism and Developmental Disorders*, 32, 397 – 422.
- Berkeley, S., Zittel, L., Pitney, L., & Nichols, S. (2001). Locomotor and object control skills of children diagnosed with autism. *Adapted Physical Activity Quarterly*, 18, 405 – 416.
- Deci, E. & Ryan, R. (2000). The “What” and “Why” of goal pursuits: human needs and the self-determination of behavior. *Psychological Inquiry*, 11, 227 – 268.

- Draheim, C., Williams, D., & McCubbin, J. (2002). Prevalence of physical inactivity and recommended physical activity in community-based adults with mental retardation. *Mental Retardation*, 40, 436 – 444.
- Ellis, D., Cress, P., & Spellman, C. (1992). Using timers and lap counters to promote self-management of independent exercise in adolescents with mental retardation. *Education and Training in Mental Retardation*, 27, 51 – 59.
- Firman, K., Beare, P., & Loyd, R. (2002). Enhancing self-management in students with mental retardation: extrinsic versus intrinsic procedures. *Education and Training in Developmental Disabilities*, 37, 163 – 171.
- Fombonne, E. (2003). Epidemiological surveys of autism and other pervasive developmental disorders: An update. *Journal of Autism and Developmental Disabilities*, 33, 365-372.
- Ganz, J. & Sigafoos, J. (2005). Self-monitoring: Are young adults with MR and autism able to utilize cognitive strategies independently? *Education and Training in Developmental Disabilities*, 40, 24-33.
- Ghaziuddin, M. & Butler, E. (1998). Clumsiness in autism and Asperger syndrome: A further report. *Journal of Intellectual Disability Research*, 42(1), 43 – 48.
- Gillespie, M. (2003). Cardiovascular fitness of young Canadian children with and without mental retardation. *Education and Training in Developmental Disabilities*, 38, 296– 301.
- Hughes, C., Copeland, S., Agran, M., Wehmeyer, M., Rodi, M., & Presley, J. (2002). Using self-monitoring to improve performance in general education high school classes. *Education and Training in Mental Retardation and Developmental Disorders*, 37, 262 – 272.

Hughes, C., Russel, J., & Robbins, T. (1994). Evidence for executive dysfunction in autism.

Neuropsychology, 32, 477 – 492.

Kennedy, C. (2005). *Single-case designs for educational research*. Boston: Allyn and Bacon.

Kern, L., Vorndran, C., Hilt, A., Ringdaht, J., Adelman, B., & Dunlap, G. (1998). Choice as

an intervention to improve behavior: a review of the literature. *Journal of Behavioral*

Education, 8, 151-169.

Koegel, R., Koegel, L., & Carter, C. (1999). Pivotal teaching interactions for children with

autism. *School Psychology Review*, 28, 576 – 594.

Koegel, R., Koegel, L., & McNeerney, E. (2001). Pivotal areas in interventions for autism.

Journal of Clinical Child Psychology, 30, 19 – 32.

Levinson, L., & Reid, G. (1993). The effects of exercise intensity on the stereotypic behaviors

of individuals with autism. *Adapted Physical Activity Quarterly*, 10, 255 – 268.

Lombard, D., Lombard, T., & Winett, R. (1995). Walking to meet health guidelines: The

effect of prompting frequency and prompt structure. *Health Psychology*, 14, 164 – 170.

Manjiviona, J. & Prior, M. (1995). Comparison of Asperger's syndrome and high-functioning

autistic children on a test of motor impairment. *Journal of Autism and Developmental*

Disorders, 25, 23 – 39.

Ministere de l'Education de Quebec. (1996). *Guide de la declaration d'effectif scolaire des*

jeunes en formation generale. Quebec: Direction de l'adaptation scolaire et des services

complementaire.

National Research Council. (2001). *Educating children with autism*. Committee on

Educational Interventions for Children with Autism. Division of Behavioral and Social

Sciences and Education. Washington, DC: National Academy Press.

- Ornitz, E. M., Guthrie, D., & Farley, A.J. (1977). The early development of autistic children. *Journal of Autism and Childhood Schizophrenia*, 7, 207 – 229.
- Ozonoff, S., Strayer, D., McMahon, M., & Filloux, F. (1994). Executive function abilities in autism and Tourette syndrome: An information processing approach. *Journal of Child Psychology and Psychiatry*, 35, 1015 – 1032.
- Prupas, A., & Reid, G. (2001). Effects of exercise frequency on stereotypic behaviors of children with developmental disorders. *Education and Training in Mental Retardation and Developmental Disorders*, 36, 196 – 206.
- Reid, G., & Collier, D. (2002). Motor behavior and the autism spectrum disorders – Introduction. *Palaestra*, 18(4), 20 – 27.
- Reid, G., O'Connor, & Lloyd, M. (2003). The autism spectrum disorders: Physical activity instruction. *Palaestra*, 19(2), 20-26, 47-48. .
- Renner, P., Klinger, L., & Klinger, M. (2000). Implicit and explicit memory in autism: is autism an amnesic disorder? *Journal of Autism and Developmental Disorders*, 30, 3 –14.
- Schopler, E. (1994). A statewide program for the treatment and education of autistic and related communication handicapped children (TEACCH). *Psychosis and Pervasive Disorders*, 3, 91 – 103.
- Smith, I. (2000). Motor functioning in Asperger Syndrome. In A. Klin, F.R. Volkmar, & S.S. Sparrow (Eds.), *Asperger Syndrome*, (pp. 97 – 126). New York: The Guilford Press.
- Stafford, A., Alberto, P., Fredrick, L., Heflin, J., & Heller, K. (2002). Preference variability and the instruction of choice making with students with severe intellectual disabilities. *Education and Training in Mental Retardation and Developmental Disorders*, 37, 70-88.

- Stanish, H. (2004). Accuracy of pedometers and walking activity in adults with mental retardation. *Adapted Physical Activity Quarterly*, 21, 167 – 179.
- ter Laak, H., Jaspar, H., Gabreels, F., Breuer, R., Sengers, E., Joosten, E., Stadhouders, A., & Gabreels-Festen. (1981). Congenital fibre type disproportion. *Clinical Neurology and Neurosurgery*, 83(2), 67-79.
- Ulrich, D. (1985). *Test of Gross Motor Development*. Austin, TX.: Pro-Ed.
- U.S. Department of Health and Human Services (1996). *A report of the Surgeon General: Physical activity and health*. Springfield, VA: National Technical Information Service.
- U.S. Department of Health and Human Services (1999). *Promoting physical activity: a guide for community action*. Champaign, IL: Human Kinetics
- van der Mars, H. (1989). Systematic observation: an introduction.. In P. Drast, D. Zakrajsek, & V. Mancini (Eds.), *Analyzing physical education and sport instruction* (pp. 3-28). Champaign, IL: Human Kinetics.
- Weber, J. & Wernheim, E.H. (1989). Relationship of self-monitoring, special attention, body fat percentage, and self-motivation to attendance at a community gymnasium. *Journal of Sport & Exercise Psychology*, 11, 105 -111.
- Wing, L., & Potter, D. (2002). The epidemiology of autistic spectrum disorders: Is the prevalence rising? *Mental Retardation and Developmental Disabilities Research Reviews*, 8, 151 - 161.

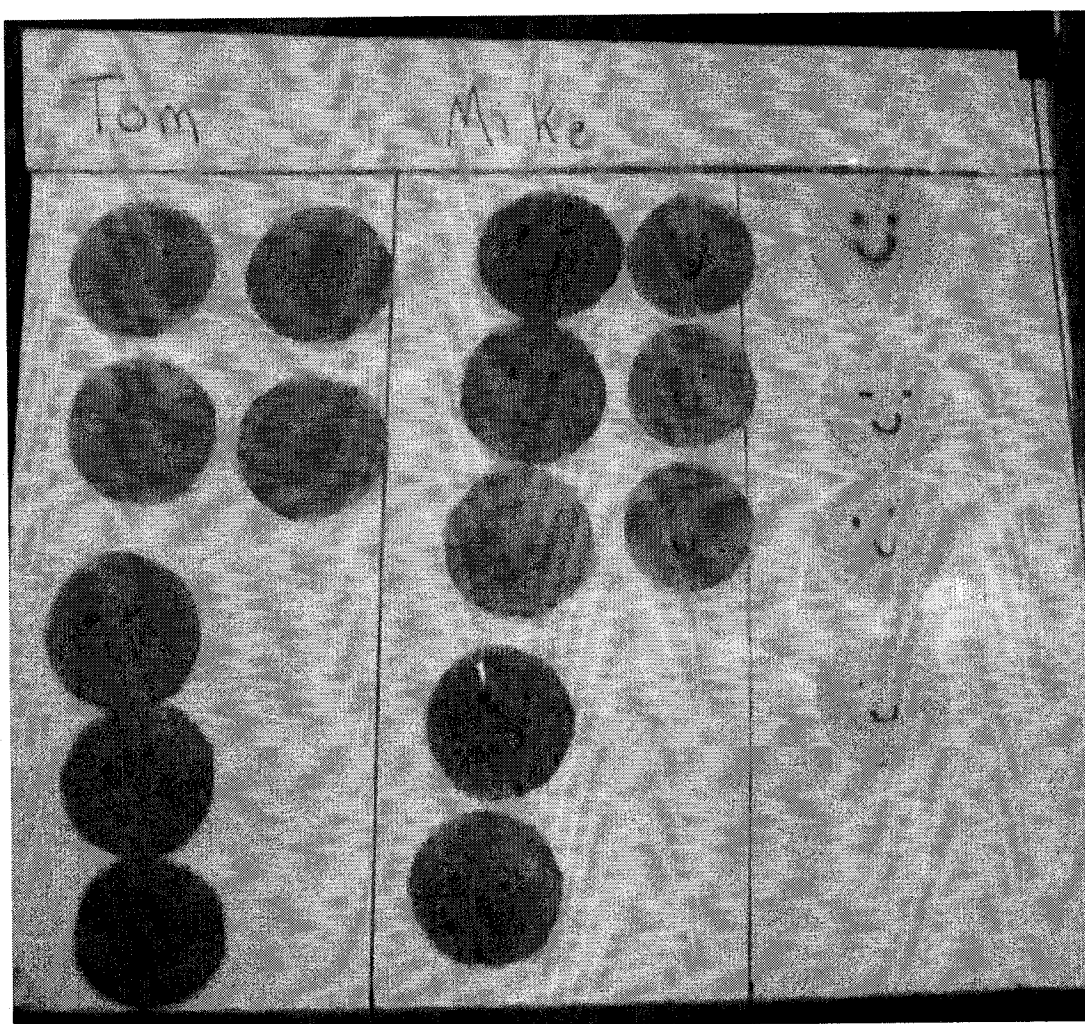


Figure 1. Self-monitoring board.

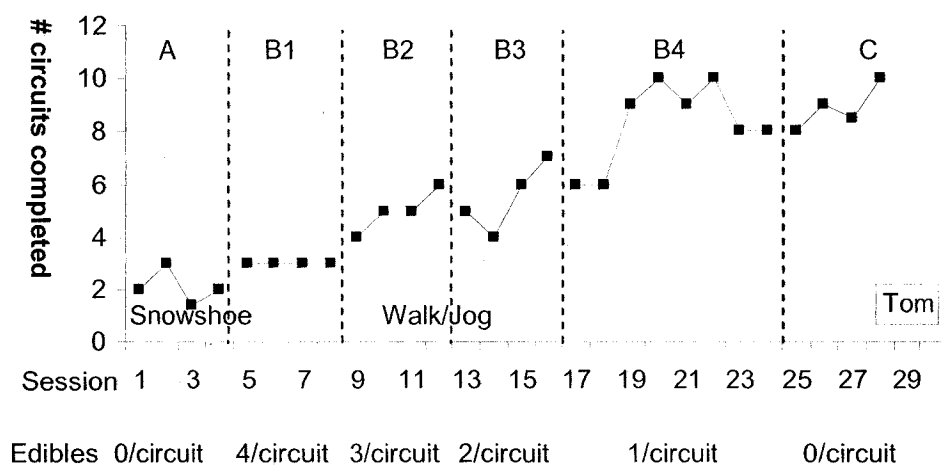


Figure 2. Distance Tom snowshoed/walked/ jogged over 28 sessions. Condition A, baseline - no edible reinforcers and no self-monitoring. Condition B, distance was self-monitored and Tom received edible reinforcers. This condition is divided into 4 phases depending on the number of edible reinforcers: 4, 3, 2, and 1. Condition C, self-monitoring continued, no edible reinforcers were provided.

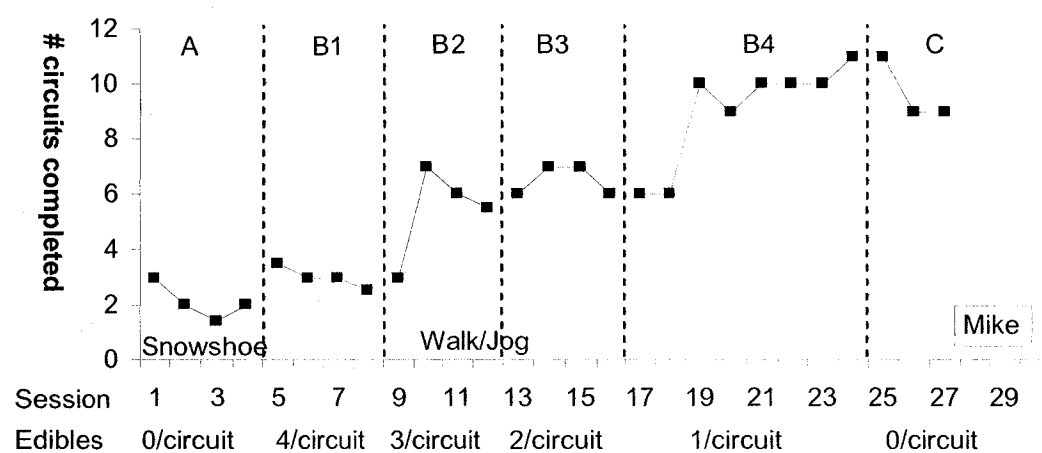


Figure 3. Distance Mike snowshoed/walked/ jogged over 28 sessions. Condition A, baseline - no edible reinforcers and no self-monitoring. Condition B, distance was self-monitored and Mike received edible reinforcers. This condition is divided into 4 phases depending on the number of edible reinforcers: 4, 3, 2, and 1. Condition C, self-monitoring continued, no edible reinforcers were provided.

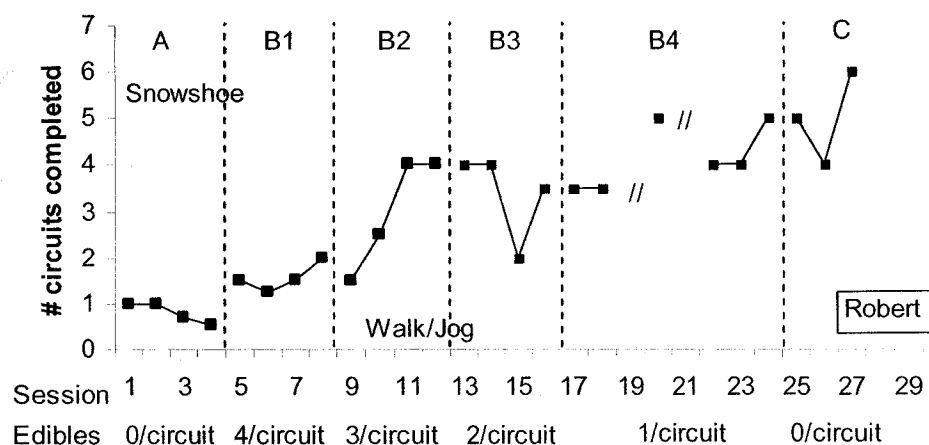


Figure 4. Distance Robert snowshoed/walked/ jogged over 28 sessions. Condition A, baseline - no edible reinforcers and no self-monitoring. Condition B, distance was self-monitored and Robert received edible reinforcers. This condition is divided into 4 phases depending on the number of edible reinforcers: 4, 3, 2, and 1. Condition C, self-monitoring continued, no edible reinforcers were provided.

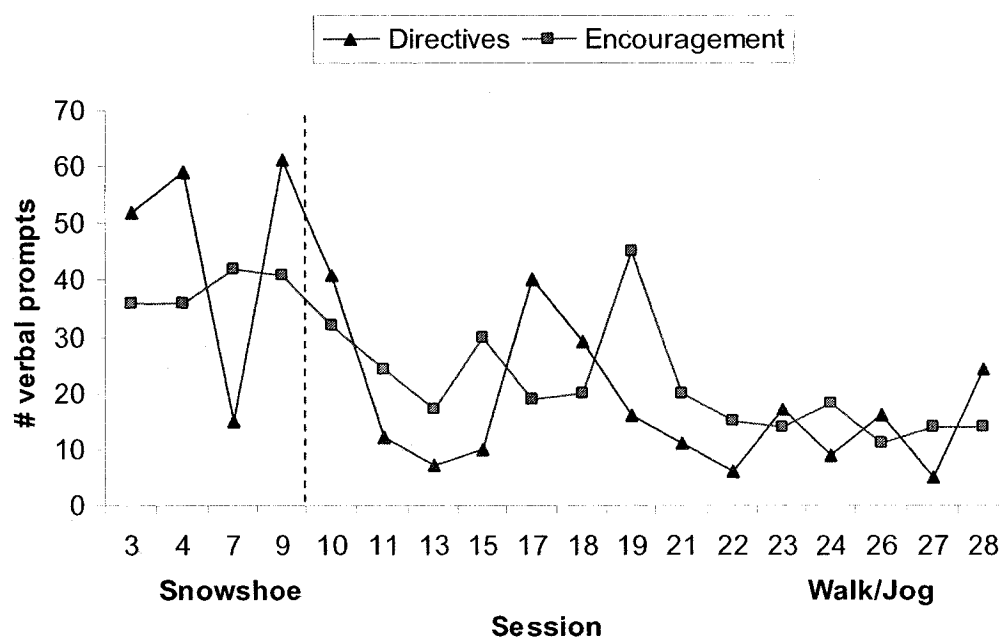


Figure 5. Number of verbal cues, encouragement and directives, given by staff during selected sessions of the snowshoe/walk/jog program.

Bridging Manuscripts and Contributing Authors

Chapter 2 described a study designed to increase the distance snowshoed, walked, or jogged during 30-minutes for three young men with autism. The educational intervention was based on one self-determination skill, self-monitoring, and two types of reinforcers, edible and verbal. Though the results were positive it was impossible to identify functional relationships between the variables and increased physical activity. The study in the next chapter, Chapter 3, expands on the intervention used in the first study. This intervention includes two self-determination skills; self-monitoring and goal-setting, while edible reinforcers were omitted. A repeated measures design was used to aid in understanding the functional relationship between the intervention strategy and the amount of physical activity performed. This was also a mixed methods design with both quantitative and qualitative data collected. Distance walked and jogged during 30 minutes was recorded, as well, as photographs of the participants taken during the physical activity. The photographs were analyzed to better understand the affective experience of the participants when they attended the physical activity. This was an attempt to hear the voice of this vulnerable population.

As first author of the next manuscript I was responsible for the design, implementation of the intervention, data collection, data analysis, and writing the manuscript. Dr. Reid's role was one of advisor. He gave advice during all phases of the study and edited the manuscript. The relative contribution of Dr. Reid and myself was 85% and 15% respectively. Drs. Peggy Downey and Lynn Butler-Kisber were also consulted during the analysis of the qualitative data.

Chapter 3

Self-management and engagement of adolescents with ASD during physical activity

Teri Todd and Greg Reid

Abstract

This mixed methods study investigated an instructional strategy, guided by self-determination theory, designed to promote sustained physical activity for adolescents with autism spectrum disorder (ASD). Two self-determination skills, self-monitoring and goal-setting were part of a walk/jog program. Four students with ASD walked/jogged for 30 minutes twice a week with photographs taken during the activity. Visual methodologies were used to analyze the photographs. One major finding was that enjoyment increased with time. Though distance walked/jogged did not increase the participants were engaged in the activity and attended regularly. The photographs gave an opportunity for them to share their voice of what they found in engaging – playing teacher and independence. Understanding the components which engaged the participants will help guide future strategies.

Self-management and engagement of adolescents with ASD during physical activity

More than half of Canadians are at risk for chronic disease and premature death due to sedentary lifestyles (Canadian Fitness and Lifestyle Research Institute, 2002). This number is even higher for people with disabilities; present studies estimate that 62% lead sedentary lives (Human Resources and Skill Development Canada [HRSDC], 2004, Haverkamp, 2004). It is estimated 3.6 million Canadians have a disability which means that over 2.2 million people with disabilities are at risk (HRSDC, 2004). Therefore, encouraging participation in regular, sustained physical activity must become a priority. Adherence to regular physical activity and exercise has been a focus for people without disabilities during the past decade (e.g. Fallon, Hausenblas, & Nigg, 2005; McCauley, Jerome, Elavasky, Marquez, & Ramsey, 2003; Oman & King, 1998; Wilson, Rodgers, Fraser, & Murray, 2004) but there is little study of people with disabilities, particularly those with severe intellectual disabilities and autism spectrum disorders (ASD). The present mixed methods study investigates an instructional strategy designed to increase sustained physical activity for adolescents with severe intellectual disabilities and ASD.

People without disabilities participate in physical activities for many reasons (Bandura, 1997; Deci & Ryan, 2000; Wilson, Rodgers, Frader, & Murray, 2004), although factors influencing people with disabilities are just beginning to be understood. Contemporary research has investigated views and experiences of individuals with disabilities who are able to communicate with others easily (Fitzpatrick & Watkinson, 2003; Goodwin & Compton, 2004; Goodwin & Staples, 2005) but it remains a challenge to understand the experience of students with severe communication challenges (Todd & Reid, 2004). Traditionally, students voices have not been heard (Lensmire, 1998), particularly those with severe communication

difficulties, leaving this group with virtually no voice. Voice is a word with many definitions; such as the right to express one's wishes (Webster 1996). Zamierowski (1949, cited in Freire, 1972) provided a 12 dimension definition of voice, one being voice as a point of contact with institutional and/or academic power. That is the voice being sought, information in an academic setting that may change instruction for students with severe intellectual disability and ASD. Freire pointed out that listening to the voices of students involved in a program is an essential element in learning environments. Understanding the experience of people with ASD, especially with limited communication is a challenge, but should lead to awareness of motivation in physical activity.

Engaging people who are marginalized by their disability, in ways they can be heard, is an important part of research in adapted physical activity. Visual methodologies may be one avenue to access the 'voice' of non-verbal students with ASD. Photovoice, a visual methodology developed by Wang, Burris and colleagues (Wang & Burris, 1994, 1997; Wang, Yi, Tao & Carovano, 1996; Wang, 2005) was developed to give insight into others' lives. Wang and Burris (1997) based their method on three theoretical underpinnings; Freire's (1972) education for critical consciousness and feminist theory; efforts to challenge assumptions about documentary authorship; and their own experiences with women from Yunnan. Photovoice is a participatory action research strategy (PAR) which seemed well suited to our endeavor of hearing the voiceless. Participants in Photovoice are given cameras so they may record parts of their lives through photographs, reflect on the pictures, and use them to catalyze change in ways which support their needs (Wang & Burris, 1997). Wang and Burris (1997) explain that Photovoice enables researchers and practitioners to perceive the world from the viewpoint of the person with the camera. This approach can be powerful

for “workers, children, peasants, people who do not read or write in the dominant language, and people with socially stigmatized health conditions or status. It recognizes that such people often have expertise and insight into their own communities and worlds that professionals and outsiders lack” (Wang & Burris, p. 370). The use of photographs to tell a story has been successful in providing a unique perspective of society’s most vulnerable populations (e.g. Booth & Booth, 2003; Carnahan, 2006; Lykes, 2001, Mitchell & Allnutt, in press). Moving beyond what can be easily observed in a physical activity setting, for instance distance walked or volleys completed, provides a more holistic perspective to physical activity.

Enjoyment of an activity is an important factor in engagement. In fact, Dacey (2004) found enjoyment to be a motivating factor in physical activity program participation by older adults, consistent with theories of self-efficacy and self-determination (Bandura, 1997; Deci & Ryan, 2000). As voiceless participants share experiences, in this study through the use of photographs, we may begin to realize if the activity was enjoyable. Recognition of the critical elements affecting physical activity may lead to effective intervention strategies.

The instructional strategy employed during the walk/run program of the current study was influenced by the self-determined learning theory (Wehmeyer, Abery, Mithaug, & Stancliffe, 2003). Self-determination refers to making decisions and taking actions based on one’s own mind or free will, without undue external compulsion. “It is the product of both the individual and the environment – of the person using the skills, knowledge, and beliefs at his/her disposal to act on the environment with the goal of obtaining valued and desired outcomes” (Wehmeyer et al., 2003, p. 27). Though students without disabilities often develop self-determination skills, people with ASD need to be taught the skills (Koegel, Koegel, & McNerny, 2001). Skills such as self-management, problem-solving, and goal setting enable

students to engage in an activity with some autonomy (Stancliffe & Abery, 2003). The tripartite ecological theory of self-determination predicts that environments which are structured to allow individuals to exert some degree of personal control, through self-determination skills, are effective in developing a high sense of self-efficacy and internal locus of control (Stancliffe & Abery). In turn, these variables have a positive impact on engagement.

The first step in Mithaug, Wehemyer, Agran, Martin and Palmer's (1998) Self-Determined Learning Theory (SDLT) model, designed for students with disabilities, is to define the problem and set a goal. In the present study goal-setting and self-monitoring were identified as skills that could be taught during the physical activity program. Goal setting was chosen because it is the first step in the SDLT model and is a pivotal skill (Koegel et al., 2001). Support in setting and monitoring achievement goals may increase personal control, intrinsic motivation, and enjoyment (Cleary & Zimmerman, 2004).

Goal setting can be defined as the act of deciding on specific outcomes of learning or performance (Latham, Winters & Locke, 1994). Goal setting is most effective when goals are task oriented, clear, specific, quantifiable, and are enhanced by ongoing feedback describing progress towards the goal. A goal is the object or aim of an action (Locke & Latham, 2002) and thereby directs a person to intentionally achieve the objective through behavior. Locke and Latham (2002) hypothesized that there are two main factors which facilitate a person's commitment to reaching a goal, perceived importance of the goal and feedback on goal attainment (Bandura, 1997). Locke and Latham hypothesized that external referents allow a person to adjust their behavior, if required to allow successful completion of a goal, and

increase motivation (2002). Self-monitoring combined with goal-setting provided feedback to participants during an activity.

Self-monitoring promotes independence and increases participation but is seldom taught or followed in educational programs (Agran et al., 2005). Lombard, Lombard, and Winett (1995) and Weber and Wernheim (1989) found that self-monitoring in conjunction with prompting and extra attention increased participation in exercise programs for individuals without disabilities over a 4- to 6-month period. Unfortunately, little research has been conducted on self-monitoring for students with autism and severe intellectual disabilities (Ganz & Sigafoos, 2005), although this strategy has the potential to increase student participation in educational and activity settings (Agran et al.).

Todd and Reid (2006) designed an intervention which included self-monitoring, tangible reinforcers, and verbal prompting during a snowshoe/walk/jog activity for adolescents with ASD. Distance walked and jogged by the participants increased throughout the program while edible reinforcers and verbal cueing decreased. This positive results formed the basis for the present study. Edible reinforcers were omitted and goal-setting was added to the present intervention. The use of edible reinforcers in the previous study did not permit a clear conclusion on the effectiveness of the self-monitoring intervention, therefore edibles were eliminated. Due to the nature of the activity, verbal cueing was not eliminated but was controlled in the present study. Goal setting, an essential self-determination skill, seemed a natural addition to the intervention strategy. Many people identify a goal such as distance to run or amount of weight to lift prior to starting the activity.

Teaching and encouraging goal setting and self-monitoring may be one method of promoting physical activity for individuals with autism. In addition, the students' voice may

provide meaning to that experience and provide insight into what was enjoyable, what was motivating, and what needed to change. More specifically, we investigated the impact of an intervention program that included goal setting, self-monitoring, and verbal cuing on engagement and enjoyment in sustained physical activity for adolescents with autism.

Method

Participants

Three males and one female, 15 – 17 years of age, enrolled in a school for students with severe intellectual disabilities participated in a walk/jog program. Each student had a primary diagnosis of autism. Three of the participants were non-verbal while one student had limited verbal communication abilities. All participants communicated within the school using pictograms. Participants were recommended for the walk/jog program by classroom teachers on the basis of a) high energy level (usually described as excessive non-purposeful movement), or b) low fitness levels (perceived by teacher/parent). Permission had been obtained by the school for the students to partake in physical activities and community outings, such as going to the park. Parental permission was also obtained to take photographs intended for research purposes.

The students were categorized as having autism and were classified according to the guidelines of the the Ministere de l'Education de Quebec's Guide de la Declaration d'Effect Scolaire des Jeunes en Formation Generale (DCS; Ministere de l'Eduation de Quebec, 1996). This uses the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 1994) guidelines for autism, as diagnosed by a multidisciplinary team in conjunction with a psychiatrist. Specific details of the participants' cognitive abilities were

not available but since they attended a school for students with an intellectual disability they were considered to have autism and intellectual disability.

Mary, John, and Liam attended a class with a staff/student ratio of 4:11. They were able to follow instructions and work with minimal guidance in a structured environment. One staff member from this classroom joined the walk/jog sessions. Kyle required constant supervision and prompting to follow the school routine and was in another class. A 1:1 staff/student ratio was maintained for him during the program.

Mary was 16 years old and enjoyed social activities. At school she often sought out the company of adults and a few select classmates; the teacher reported that she preferred socializing over school work and often needed supervision to complete her projects. Mary spoke in one or two word phrases when prompted to answer a question, but was often echolalic, chanting a phrase over and over for several hours. At home Mary usually watched television and engaged in table activities, physical activity was not a regular part of her life. Mary's teacher recommended that she take part in the program because she had few opportunities to be physically active and she had low muscle tone in the trunk. She was hesitant to join the group, in fact, she did not even own a pair of running shoes. After we provided a new pair of proper fitting running shoes Mary agreed to accompany the group to the park.

Liam was 16 years old and had an easy temperament; his teacher reported that he was often a target for aggressions from other students because he did not react. The teacher recommended Liam participate in the walk/jog program because he liked to be outside and he did not regularly attend physical activities, either at school or at home. Social interaction was

difficult for Liam, joint attention was limited as he kept his face tilted toward the floor most of the time. Liam was non-verbal but communicated well with pictograms

Tom was 17 years old and very active, he participated in several physical activities on a regular basis with his family. He enjoyed being outside and would often wait at the classroom door with a big smile when the first author arrived to lead the program. Tom was generally happy and engaged in a high degree of stereotypic behaviors such as hand flapping, swallowing air, running water over his hands and face, and vocalizations (high pitch humming). He self-mutilated by scratching his face, hands, and lower arms until they bled. Tom was able to follow the classroom schedule and work independently if the work material was organized. He was non-verbal and used pictograms efficiently to communicate his needs.

Kyle, 15 years old was the youngest participating student in the walk/jog program. He was non-verbal and communicated with pictograms when responding to questions and following schedules. Kyle was constantly moving around the classroom and enjoyed being outside when the weather was warm but resisted leaving the school if the temperature was a bit cool. He did not like to wear shoes and was usually barefoot in the school building, as shoes were mandatory at the park for safety reasons; Kyle was sometimes reluctant to participate. The only shoes Kyle would wear were slippers or flip flops, consequently jogging was difficult and he walked during most of the program. Kyle was very social with the teaching assistant from his classroom, often taking her hand, looking into her eyes, and taking her with him as he walked around the circuit. He did not initiate interaction with anyone else during the program but did respond if others interacted directly with him.

Instrumentation

Activity

An hour long physical activity program at a local park was offered twice a week, Tuesday and Friday mornings from mid October to the beginning of December and from April through the middle of June. Six Friday sessions were cancelled due to professional development days and two days because of field trips. Additional sessions were missed on individual basis due to participant or staff absence. In all 27 sessions were offered, 7 or 8 sessions for each participant during Phase A and 18 or 19 sessions in Phase B.

Each session consisted of walking to the park, walking/jogging for thirty minutes, and returning to the school. At the park the students walked/jogged and used two self-determination skills, goal setting and self-monitoring.

Activity circuit

A diamond shaped (185 m x 160 m) circuit was well-defined within the boundaries of a standard soccer field. The start/finish point of the circuit was a permanent bench mid-way along one side of the soccer field. The remainder of the circuit was marked by three flag poles (1.1 m. high with 4 flags: yellow, green, red, and blue), one flag pole was placed opposite the start/finish point on the other side of the soccer field, and one flag pole was placed in front of each goal at both ends of the field.

The activity took place inside the school on rainy days. The goal setting/monitoring board and the three flag poles were set in each corner of the gymnasium. Each circuit was 173 m, approximately one quarter of the total circuit distance at the park. Therefore four indoor circuits equalled one outdoor circuit.

Goal setting card

A laminated 15 cm x 37.5 cm card made of green poster paper was prepared for each participant prior to the start of the session. Each card was designed to accommodate two intensity pictograms and two number cards. The intensity and number pictograms were made of laminated cardboard squares, 10 cm x 10 cm, which could be attached by Velcro to the goal setting card (Fig. 2). The high intensity pictogram was a stick figure running, the low intensity a stick figure walking. The number pictograms had a printed number and the corresponding number of small markers. For instance, for six, the square would have a number 6 and six small happy face markers on it. Goal setting was individualized; the number of circuits shown to each participant was calculated as the average of the previous three sessions, and that number plus one. Therefore the two number pictograms offered always differed by one. The set of goal cards, ranging from 2 through 12, were placed in a box at the start/finish point, occasionally participants chose a goal card which was not presented on the goal setting card. This occurred once for Tom, twice for Mary, and three times for Liam.

Goal setting/Self-monitoring board

The goal setting/monitoring board was placed at the start/finish point of the activity circuit. The board was made of laminated white poster paper, 76.2 cm x 101.6 cm. Vertical columns divided the board, the name of each participant was written at the top of one column. Three types of information were recorded on the board: intensity goal, distance goal, and distance completed (Fig. 1).

The chosen intensity pictogram was placed on the recording board under each participant's name. Small happy face markers representing the distance goal were placed on

the left side of the column. The participants placed a 7.6 cm diameter happy face marker on the right side of the column, across from the small happy faces, each time they completed a circuit. Each participant was assigned a colour, his or her name was written in the colour which matched the happy face markers. Four colours; blue, red, orange, and green were used in designing the board.

Audiotapes

Two teaching assistants each wore a waist pack containing a portable tape recorder during 14 sessions. The tape recorder and 60 minute cassette tapes were used to record comments made by the staff during the activity session. The tapes were labelled by name and date and used to determine the number of verbal directives given during a 30 minute session. Directives were defined as directions given to participants during the physical activity.

Photographs

An adaptation of the PhotoVoice methodology was used to understand the students' experience (Wang & Burris, 1997). Traditionally participants take photographs and then choose several of the images to represent what they believe are important. Meanings are given to individual photographs, either verbally or written, from which themes are identified and shared with a larger audience. This created a methodological dilemma since the participants were not able to take photographs independently or give meaning verbally or in writing. We adapted the methodology by having the primary researcher take the photographs and chose a sample to represent the students' experience. Photographs were taken at the beginning, middle, and end of 18 walk/jog sessions throughout the program.

The participants were photographed from late October until the end of the program in June using a Fujifilm FinePix A250 digital camera. The photographs were labelled by

participant name, time taken in the session, and date. The primary researcher and a professor versed in qualitative methods but not involved with this study, selected a sample of 42 photographs to represent the students' experience. The sample included photographs taken across the 18 sessions and during the beginning, middle, and end of several 30 minute sessions. Photographs were not taken during sessions when a staff member was absent as the primary author acted as a substitute for the staff member and was unable to take the photographs on a regular basis during the session, therefore pictures were missing from certain dates. In addition, the camera malfunctioned on two occasions. Selection criteria consisted of photographs which showed a participant's facial expression clearly, the participants engaged in some aspect of the program, and those which had been screened by the participants. These pictures were randomly divided into 3 sets of 14 pictures labelled A, B, and C.

Ultimately there was potential for personal judgment by the researchers to impact the results as they chose the pictures (Wang and Burris, 1997). Therefore care was taken to ensure that power remained with the participants (Booth & Booth, 2003), in this case to describe their experience during a physical activity program. In order to preserve the participants' power the photographs were screened by the participants prior to being used in the study, affect was also rated by each participant also. Pictograms of three faces designed to represent negative, neutral, and positive affect were used to represent varying levels of enjoyment. Though deficits in face processing of emotion is common for people with ASD, recent research has found that there is no deficit when processing emotion of cartoon faces (Bastard Rosset et al., 2006). The participants indicated the affect that was portrayed in each photograph by pointing to one of the pictograms. The pictograms were arranged in a specific

order, negative, neutral, and positive from left to right on a flat surface with a space equal to one pictogram between each. One photograph was placed above the pictograms and the student was asked to point to the pictogram which best described how he or she was feeling at the time the photograph was taken. When a participant pointed to two pictograms at the same time, for example happy and neutral, an answer of somewhat happy was recorded. This was repeated for each photograph.

In June the photographs were evaluated for affect by staff members and parents using a scale with a continuum from positive to negative. The scale had five vertical marks on a 9.5 cm horizontal line, the marks were not numbered. Negative was written directly under the line at the far left, neutral, in the middle (under the 3rd vertical mark) and positive at the far right. Staff and parents were asked to place a mark on the vertical line which best explained the affect shown by the participant in each photograph.

Staff members participated in two additional activities, temporal arrangement of photographs and storytelling. Eight sets of photographs consisting of a minimum of three photographs of one participant during one session were used for this activity. Temporal arrangement was carried out by asking six staff to place a set photographs in the order in which they felt they occurred during one 30 minute session. The staff members who accompanied the participants to the program were asked to participate in the storytelling activity. All 42 photographs were placed on a table and staff members choose several photographs of the participant from their class and told a story of their experience during the program. Both of the activities were videotaped.

Fieldnotes

At the end of each physical activity session the weather, attendance, participant mood, condition of the soccer field, and reflections on what had happened during the session were recorded. The fieldnotes allowed the researcher to contextualize the photographs and distance walked/jogged when analyzing the data.

Trustworthiness

Trustworthiness can be viewed from several angles, descriptive validity, or the factual accuracy of the event(s), interpretive validity, refers to the accuracy with which the participants' meaning about the event is portrayed, and theoretical validity, the degree to which the theoretical explanation fits the data (Johnson & Turner, 2003). Each element of trustworthiness was addressed to enhance the validity of this study.

Trustworthiness, in particular descriptive validity, was established by data triangulation, the researchers' prolonged field engagement, and explicit statement of researcher bias (Brantlinger, Jimenez, Klinger, Pugach, & Richardson, 2005; Creswell & Clark, 2007, Denzin & Lincoln, 2003). Descriptive validity addresses the credibility of the findings.

Triangulation of data was done through the use of various data sources: distance covered, goal setting, photograph ratings by students and staff, and fieldnotes. Viewing one phenomenon through various data sources helps establish trustworthiness and provides crystallization (Cresswell & Clark, 2007; Denzin & Lincoln, 2003). Crystallization recognizes the complexity of social issues and the need for phenomena to be viewed from a variety of angles. This attempt to use visual methodologies to hear the voice of primarily silent people can be interpreted as adding another angle when looking at this complex issue.

Credibility of the data were enhanced by the researcher's prolonged field engagement. The primary researcher was involved with the physical education program in the school for three years; the change in the student population over this period was minimal. Interaction between the students in this study and the researcher was maintained over the three year period with the researcher spending time in the classroom on a weekly basis. This ongoing involvement allowed a positive rapport to be established with the students prior to the start of the physical activity program.

The second element of trustworthiness, interpretive validity, was established by seeking self-reports from the participants during the analysis of the photographs. The rating scale was adapted so that the participants could give their meaning to the photographs. Careful refinement of question format and wording, the use of pictorial formats, as well as, evaluating a person's understanding of the questions and the response format, have been recognized as important advances in enabling people with severe disabilities to be included in research endeavors (Stancliffe & Abery, 2003). All of the above techniques were combined to create a tool which allowed the participants to be active members in the present study.

Interpretive validity is enhanced by a statement of researcher bias. The primary author and researcher is the parent of three children, one who has autism and attends the same school as the participants in the study. She lives in the same suburban area as the school and encounters some of the students and their parents at various functions and outings. This researcher is a firm believer in the empowerment process and advocate for all people, with or without disabilities, to exercise self-determination skills. She worked as an adapted physical activity professional in the social service network before taking a break to raise a family. During that time she interacted with health, education, and social service professionals on a

continual basis and became involved in several family support groups. The primary researcher has experience in the autism field at many levels, from providing services to being the recipient of services. Thus she possesses extensive knowledge of many areas of concern for individuals with ASD and their families, and is able to see problems from several view points. To ensure that her personal viewpoints did not influence the participants she kept fieldnotes of her interactions with the participants and took a critical approach to examining these. She also systematically took time to observe the participants each session, therefore moving away from direct engagement, this did not change the dynamics of the sessions.

The final element of trustworthiness, theoretical validity, was established by using a theoretical lens when designing the study. Self-determination theory guided this study and the results were compared to the theoretical framework and compatibility was assessed (Johnson & Turner, 2003).

Design

A triangulation concurrent mixed method design was used, the research guided by the theoretical perspective of self-determination theory (Creswell & Clark, 2007). Quantitative and qualitative aspects of data collection were given equal importance and occurred concurrently. The integration of the different data occurred during analysis and interpretation.

The program was divided into two phases, both being repeated, therefore the design was A-B -A-B. Phase A was baseline, during which the participants walked/jogged around the circuit and self-monitored the distance completed by placing a marker on the self-monitoring board as each circuit was completed. Goal setting was introduced in Phase B, during which participants set an intensity and distance goal for each session. These goals were placed on the self-monitoring board. Following the break for the winter months the baseline condition was

repeated for three sessions to re-familiarize the participants with the activity. Repeating the A and B phases allows a more robust interpretation of the data (Alberto & Troutman, 2006) and permits each participant to be their own control.

Procedure

The participants know the days for the physical activity because a pictogram of a person walking, was placed on each participant's daily schedule on Tuesday and Friday mornings. Each session lasted one hour, the first 15 minutes consisted of dressing in outdoor clothing and walking 0.45 Km to the park. The actual walk/jog program occurred for 30 minutes, and the final 15 minutes was spent walking back to the school and putting away outdoor clothing and equipment.

The primary researcher and two teaching assistants accompanied Mary, Liam, Tom, and Kyle to the park. The students began walking or jogging around the circuit as soon as they reached the park during Phase A, baseline. Throughout Phase B each student was asked to set the session's goal using the goal setting card. As soon as the goal was recorded on the self-monitoring board they started to walk or jog around the circuit. The participants recorded each completed circuit by placing a marker on the self-monitoring board as they passed the start/finish point. After 30 minutes the researcher or teaching assistants told the participants it was time to stop. The equipment was gathered and the group returned to the school.

Self-monitoring was new to Mary, Liam and Kyle. Tom had participated in a similar walk/jog program the previous year. At the beginning of the baseline sessions the primary researcher showed them how to place a happy face marker under their name, on the right side of the column. As they completed each circuit the primary researcher greeted the participant as they approached the start/finish point, gave them their happy face marker, directed them to

the self-monitoring board, and helped place the marker on the board. This procedure was carried out for three sessions. Throughout the program one school staff or the primary researcher would remain near the self-monitoring board, hand out markers and provide remainders if required.

Goal setting, a new skill for all participants, was introduced during Session 5 for Mary and Kyle and Session 6 for Tom and Liam. The start of goal setting was staggered to allow more time for explaining the new activity to each participant without disrupting the entire program. At the beginning of the session the researcher showed the goal setting card to each student and explained the meaning of the two intensity pictograms. The researcher then placed two number cards on the goal setting card, the lower number directly under the low intensity pictogram and the higher number under high intensity. The student was asked to identify which number card was greater; this was done to verify that the participants could differentiate between the cards. The order of the pictograms were randomized after four sessions, so on some occasions the low intensity pictogram might be placed above the higher number card, and sometime above the lower number. The participant was asked to choose an intensity goal and a distance goal. The researcher then placed the intensity pictogram on the self-monitoring board under the participant's name, small happy face markers equalling the distance goal were placed on the left hand side of the column.

The two teaching assistants wore waist packs containing a tape recorder during 14 sessions. At the end of the session the waist packs were returned to the researcher.

Photographs taken during the program were shown to the participants in late May and early June. At the end of the last five sessions the photographs were shown to the participants, this activity was presented for approximately five minutes; therefore it took several sessions

to screen all of the photographs. Each photograph was placed on a table and two pictograms, YES and NO were placed next to the photograph, participants were asked to point to the NO pictogram if they did not want a photograph used; we then removed photographs the participants had indicated as NO, in all two photographs were discarded. During this time period participants were shown two pictures of themselves, one happy, with the participant smiling, and one not happy. Three pictograms, 5 cm x 5 cm, were presented on a laminated card, 7.5 cm x 22.5 cm, the pictograms were of a happy face, a neutral face, and a sad face. The participants were asked to indicate the pictogram which explained how they were feeling in the picture. This was repeated three times during the last five sessions.

Data Analysis

Distance

Distance data were obtained by recording the number of circuits completed by each student during the sessions, half circuits were recorded. The distance data were visually analyzed. Data patterns within each phase of the study will be described by level, trend and variability (Kennedy, 2005). Variability was identified as high, medium, or low based on dispersion of the data points relative to the best-fit straight line (Kennedy). Data was analyzed by participant.

Goal setting

Participants were asked to set two goals, intensity and distance for each session during Phase B. The intensity goals, run or walk, chosen by the participants were compared to the number of circuits chosen as the goal and the number of circuits completed. Of interest was the comparison between distances completed when run verse walk goals were selected (Fig. 7).

The goals set by the participants were compared to the actual distance completed through visual analysis. As seen in Figures 3 to 6 when two lines are visible the goal and actual distance are different, when only one line is apparent, the goal and actual distance completed are the same. The number of sessions when the participants met the goal they set can be observed on these figures.

Verbal cueing

Two teaching assistants were audio taped during 14 sessions and audiotapes were analyzed for verbal directives. The number of directives made during the activity was analyzed using 10 sec partial interval recording (Drast, 1985). In addition, descriptive comments made by the teaching assistants were recorded and transcribed.

Photographs

Affect ratings. To establish reliability the participants rated two photographs of themselves, using the three pictograms, during three different sessions. The ratings of each photograph were compared over the three sessions, reliability was established.

During the final week of school the participants were shown their own photographs from the set of 42 and asked to indicate how they were feeling at the time the photograph was taken. The pictogram, negative, neutral, or positive affect, the participant chose to give meaning to a photograph was compared to the ratings given by the staff and parents.

Each of the set of photographs, A,B, and C, were rated by five classroom teachers or teaching assistants, therefore in total, fifteen staff members participated. Each staff member was given one set of photographs and asked to indicate which point on the scale, from negative to positive affect, best described the person in the photograph.

Three parents rated pictures of their child's photographs using the same procedure.

One parent declined to participate.

Temporal arrangement. The photographs were divided into 8 sets, staff members were asked to arrange them in the order they felt they occurred during a session. This activity was videotaped, the oral portion of the tapes was transcribed since occasionally staff members offered informal verbal analysis on their decisions.

The order of the photographs of each set was recorded. The order was compared to the actual order in which the photographs were taken. Differences between staff involved in the physical activity program and those who remained in the school were noted.

Storytelling. The staff member responsible for each participant was given all of the pictures of their participant which were part of the set of 42. They were asked to choose several pictures and tell a story of the experience. The video tapes of the story telling sessions were transcribed. The photographs selected for the storytelling activity were printed, each on a separate page, with the verbal comments transcribed directly onto the page. The meanings given to the images were coded according to procedures in the photo voice methodology (Wang, 2005). Codes which occurred on a regular basis were acknowledged and themes identified. For instance statements about the participants' growing ability to negotiate the activity on their own occurred on a regular basis, photographs which showed increasing distance between staff and participants supported these statements, this information led to the recognition of the theme of independence.

Data transformation

Data transformation entailed quantifying qualitative data to enable the data to be compared to the quantitative data. Subjective photograph ratings were made across a 5 point

scale ranging from negative to neutral to positive. Participants were shown three pictograms from which to choose. On occasion some students picked two faces, the neutral and the happy face to indicate somewhat happy, or neutral and unhappy to indicate slightly unhappy. This ended up giving the students five options to choose from. The five options, from both scales, were converted into a 5-point likert scale for the purpose of graphing the results (Fig. 8-11). Staff ratings for each photograph were added and the mean score calculated. The change in affect was analyzed for change across sessions and program. As well the ratings between participants, parents and staff were compared.

Results

Reliability

Interrater reliability was calculated for verbal directives as a percentage of total agreement for each session (Kennedy, 2005). Mean interrater reliability, calculated over 35% of the audio recordings was 89%.

Intra-rater reliability was calculated for affect ratings of the photographs. During the program the participants rated two photographs three times during five sessions. Intra-rater reliability was 83%.

Reliability was also obtained from two participants and 30% of the staff, during the following school year, nine months after the program had finished. Intra-rater reliability was calculated by dividing agreements by agreements plus disagreements (Darst, 1985). Student intra-rater reliability was 82% while staff intra-rater reliability was 74%.

Distance

The distance walked/jogged was graphed by the number of circuits completed per session. As seen in Figure 3 there was an increase in the distance walked jogged over the program for Tom from 6.2 circuits per session to an average of 7.6 circuits. There was no change in distance walked during the various phases of the program for Mary, Liam, and Kyle as seen in Figures 4, 5, and 6 respectively. Variability was moderate with considerable overlap of the number of circuits completed during the 4 phases.

Goal setting

Participants completed more circuits when the 'run' goal was set as compared to the 'walk' goal (Fig. 7). Average number of circuits completed for the walk choice was 5.2 while the average for the run choice was 6.7 circuits, during the same time period. Therefore participants were completing the circuits faster when they chose 'run' than when the walk pictogram was chosen. This suggests the participants understood the difference between the walking and running goals.

During Phase B participants also set goals indicating the number of circuits they planned to complete during each session. On average the participants were accurate at setting distance goals just over half of the time, 53.4%. Two participants met their goals more often; Mary was accurate 11 out of 16 sessions while Liam met his goals 9 times out of 14. Kyle was not as accurate though his accuracy increased towards the end of the program. In October through December Kyle met his goal one time, in May and June he was accurate 4 out of 6 sessions. Tom demonstrated the lowest accuracy rate, completing the number of circuits set as the goal 5 of 13 sessions. During the second half of the program the goal he chose was often the number of circuits completed during the previous session.

The set of goal setting cards was placed on the bench at the start/finish, occasionally participants would choose goals from the box rather than the pick one that was offered to them. This was initiated by the participant, when this occurred the goal that was retrieved from the box was set for the session. This occurred twice for Mary and Kyle, sessions 15 and 17, and 15 and 20, respectively, and one time for Tom during session 21.

Verbal cueing

The percentage of time verbal directives were given by the school staff was analyzed. Verbal directives given to participants decreased from Nov to June. During November the participants received, on average, verbal directives for 16% of each 30 minute session. This decreased to 10% for May and June. Therefore it can be argued that participants were completing the circuits with less direction from staff members as the program continued.

Photographs

Participants. Each participant rated their own photographs using a pictorial representation of the scale from negative to neutral to positive affect. As Figure 9 shows Tom's affect remained quite even over the duration of the program as indicated by the trend line on the graph. In October Tom rated his photographs on the higher end of the continuum but his ratings dropped abruptly once the weather cooled. After recommencing in April his affect ratings increased until the end of the program when there was another decline.

Mary, Liam, and Kyle demonstrated observable changes in affect over the course of the six-month program as seen by the trend lines on Figures 8, 10, and 11. In October they were quite negative towards the program as shown by the ratings of the photographs. In time they began to show more positive affect when attending the sessions, this is evidenced by the affect ratings in the later sessions of the program.

Staff. Photographs were also rated by teachers and teaching assistants. Staff members tended to rate the photographs more neutral than the students' own ratings. Figures showing the affect ratings for Mary, Kyle, and Tom (Fig. 8, 9, & 11 respectively) also illustrate the staff ratings lower than the participants own ratings. The staff ratings for Liam were more variable than the participants' ratings and in fact were occasionally more positive than his own (Fig. 10).

Staff members (teachers and teaching assistants) arranged photographs of each participant in the order they thought they occurred during a session. Staff members placed photographs with more positive affect rating at the end of a session, often verbally explaining that the participants became happier as the session progressed.

The final activity with the photographs involved the teaching assistants who regularly attended the program. Using photographs the teaching assistants told a story about the participant and their experience during the walk/jog program. The images and stories were coded. Two themes emerged: enjoyment and independence.

Even though staff tended to rate the photographs more neutrally on reviewing the photographs they often remarked on how much the students enjoyed the activity. When probed as to how they made that conclusion Mary, Tom, and Liam's teacher stated "All my class enjoyed the activity. They never experienced any desire to stay at school. In fact they were waiting – Mary knew the days". One staff noted that not only the student enjoyed the activity but she did as well "he likes it... he is usually very smiley, and when we get back he is calm and good natured. It cuts my day by half."

Independence was seen through the photographs as students were more often walking the circuit without staff in close proximity during the second half of the program. One staff

member summarized her experience with the student in her class by saying “there was a huge difference from when we first started till the, the end for me. At the beginning it was like Oh my God not again – have to go through this sorta constantly pushing him cause he didn’t want – at the end it was good, cause we just stood there and watched. He walked around – and it was fun, yeah.”. Similarly another staff member noted as she viewed a photograph this was “in the beginning when he needed me all the time. Near the end he was usually doing it by himself”.

Parents. Three parents rated their children’s photographs, the same set the participant rated, on the affect scale ranging from positive to negative. The ratings by parents were similar to the student’s own ratings. The parents of Liam and Mary gave the same affect rating as their child for all but two images. In the case of Liam, his parents were slightly more neutral on two of the 11 images. Twelve photographs of Mary were rated, her parents rated one image more negative and one more positive in affect than Mary herself.. Kyle’s parents rated nine photographs agreeing with Kyle six times, three images were rated differently, one more negative and two with more positive affect.

The affective experience of each student was analyzed. Information from photographs, video taped interviews with staff, and field notes were synthesized to create a picture of each participant’s experience. Overall positive affect increased over the course of the program and for some participants there was a notable change in affect during the session; even throughout the program some of the participants experienced negative affect at the beginning of each walk/jog session.

Discussion

In recent years psychologists have investigated the reasons people persist in physical activity (Anton et al., 2005; McAuley et al., 2003; Wilson et al., 2004). This complex topic becomes even more complicated when severe communication problems are present. Through the use of visual methodologies and a mixed methods design, which enable quantitative aspects of physical activity to be compared to the qualitative results, a broader understanding of engagement was sought. It was hoped that photographs might be one avenue for individuals with communication difficulties to share their feelings.

The walk/jog program was intended to involve participants in a simple physical activity during which the effectiveness of an instructional strategy, which included two self-determination skills: goal-setting and self-monitoring could be evaluated. Successful participation was judged by engagement of the student in the activity as measured by the number of walk/jog circuits completed. Therefore, a student was considered to be engaged in the activity if they were walking or jogging around the activity circuit. Contrary to the results of Todd and Reid (2006) where a self-monitoring strategy contributed to the distance walked or jogged by adolescents with ASD, the current strategy did not result in a substantial increase in the number of circuits completed. Only Tom increased the average distance completed during 30 minute sessions over the course of the program. Removal of edible reinforcers may have been a factor in the results, edible reinforcers were used extensively in the school and the students asked for them during the walk/jog program. Future studies with this group of students should take this into consideration. A more positive observation from is that even though the students did not increase the amount of physical activity over the 30 minute session they did attend the program on a regular basis and were physically active twice a

week. From a teaching perspective we found that participants enjoyed the program, were calmer after participating, and independence during the activity increased.

The participants were able to self-monitor during the program quite independently. Goal setting was introduced after the baseline condition and while participants were accurate in setting intensity goals, distance goals proved more difficult. Two participants completed the distance set as a goal about two-thirds of the time but the other two students met their goal during only 40% of the sessions. Personal abilities such as self-efficacy, self-esteem, locus of control, and attributions of success and failure are required to use goal setting effectively (Abery & Stancliffe, 2003). Lack of these abilities may have contributed to setting unrealistic goals, as well as, as a lack of understanding of the meaning of a goal. People with severe disabilities lack skills which enable them to behave in a self-determined manner (Wehmeyer, 2005). The skills of self-monitoring and goal-setting were taught during this program but the abilities required to support the skills were not addressed. A lack of these abilities may have rendered instruction in goal-setting to be ineffective. The development and use of these abilities, particularly self-efficacy during physical activity (Bandura, 1997), by individuals with ASD should be explored in future research.

The mixed methods design of this study allowed further investigation of the results. In particular the photographs in conjunction with story telling allowed a more in-depth look at what the participants were experiencing during the physical activity program. At the very core of the photovoice technique, a PAR strategy, is the belief that members of a vulnerable community share their experience to effectuate change (Wang & Burris, 1997). The ability to look at the experience of each participant is essential to understand the effectiveness of the instructional strategy and how it can be improved. We found that the participants were, in

fact, engaging in the activity in ways we had not anticipated. Our definition of engagement, or participation, did not match what the participants found engaging. Mary was reluctant to participant in the program in the beginning however once she began handing out the happy face markers she could not wait to get to the park each day. Though the distance walked/jogged did not increase she often completed her goal distance as fast as she could so that she had more time to hand out markers! This particular participant set the same goal consistently and stopped when the goal was met with the knowledge she could then 'play teacher'. Mary looked forward to going to the park and she was engaged in the activity but not in the way we expected

Tom may have used the distance goal to challenge himself. During the last month of the program Tom tried to beat the goal he set during a particular session, he exceeded his goal four times during the final seven sessions. When successful he took great pride in pointing out that he had more large markers than small goal markers, he also took that opportunity to stop!

Kyle was very dependent on his educator at the beginning of the program and would take her hand to walk the circuit. As the program continued he became increasingly independent, at times indicating he wanted to navigate the circuit on his own. As his educator took great pride in his independence Kyle beamed with success and began to look forward to his mornings at the park, pointing to the pictogram on his daily schedule when he arrived at the school. This may have been one of the few times during the week when he could act autonomously. Kyle became engaged in learning the two self-determination skills, self-monitoring and goal setting. These were new skills for Kyle; in October he did not appear interested in any aspect of the program, not walking, self-monitoring, or goal setting. After a few weeks he became intrigued and began experimenting with the concept of self-monitoring.

At one point, about five weeks into the program, Kyle insisted on placing *all* of the markers on the self-monitoring board upon the completion of each circuit! Though this represented a challenge to the organization of the program it was evident that this was something important to Kyle and he was becoming engaged. After two weeks Kyle stopped putting all of the markers on the board and was able to self-monitor his progress by placing one marker on the board after completing each circuit – this was a first in his school history. Goal setting accuracy improved and by the end of the program he was setting goals and working towards them. His engagement in the program seemed to revolve around learning and practicing how to set goals and self-monitor.

These results have encouraged us to step back and look at the concept of engagement differently. Understanding that engagement is individualized will encourage educators to be flexible and realize that different aspects of one program may engage different students. Mithaug and colleagues identified the conditions that stimulate students to become engaged in an activity, first, students engage themselves when they have opportunity to choose what they will do and how they will do it (Mithaug, Mithaug, Agran, Martin & Wehmeyer, 2003). People stay engaged if they are able to adjust their expectations, choices, and actions to meet their expectations.

The development of self-determination and engagement is the result of two highly interrelated factors: personal capacity and the extent to which the environments in which the person spends time support the exercise of self-determination (Abery & Stancliffe, 2003). We provided an environment which taught and supported the use of two self-determination skills and reduced external control. Research has supported a positive relationship between self-determination competencies and personal control (Stancliffe & Abery, 2003). Individuals with

severe disabilities may have limited self-determination capacities (Stancliffe et al., 2000; Wehmeyer, 2005), but nonetheless with a supportive environment are able to exercise some personal control of their activities. We chose to provide direct instruction for two essential skills for self-determination; goal setting and self-monitoring, as well as regular opportunity to practice these skills. Despite having severe disabilities all of the students were able to set realistic goals and self-monitor their progress toward the goal, using the tools provided, by the end of the program. Throughout the 27 sessions all participants received substantial support in the form of pre setup material, visual aids, access to direction from staff, and a supportive environment. Though verbal directives were faded the environment itself was designed to encourage the participants to engage in these skills. Further research should explore the generalization of self-determination skills when supports are faded.

Enjoyment of an activity is critical to engagement and persistence. Enjoyment, also defined as positive affect, was analyzed by facial expression, mainly a smile, captured in photographs taken during the program. True smiles of enjoyment, or Duchene smiles, are marked by the movement of orbicularis oculi muscle, are smooth and consistent, and it is believed that these smiles are produced on an involuntary basis (Frank, Ekman, & Friesen, 1993). Frank and colleagues (1993) found that people recognize the enjoyment smile consistently and that recognition is not context dependent. Though research concurs that individuals with ASD are impaired in face recognition it has been found that familiar, meaningful faces are easily recognized (Joseph & Tanaka, 2003; Osterling, Dawson, & Munson, 2002). In addition implicit memory is intact in individuals with ASD, therefore the participants were able to recall their experiences (Renner, Klinger, & Klinger, 2000). Recent research also confirms that individuals with ASD can discriminate between emotional

expressions (Giovannelli et al., 2005). Through the use of photographs we were able to elicit self reported information on the affective experience of the participants. The participant ratings of affect for each photograph also proved to be reliable. Even after a nine-month period the students rated the images with the same affect rating 82% of the time. Therefore we can be confident that the information gathered from Mary, Tom, Liam, and Kyle is representative of their experience during the walk/jog activity, and true to participatory action research the participants did retain power in the analysis of the data (Wang & Burris, 1997). One limitation of this study is the time between the photograph being taken and the affect rating, it is impossible to determine if the rating represents actual affect at the time the photograph was taken, or affect from reconstructed memory of the event. Future research should compare the ratings of the photographs to ratings of affect obtained during, or at the end of, the activity session.

While facial expressions can be accurate and reliably recognized they may be misleading of the affect being experienced by the individual during physical activity. Expressions of concentration, determination, even discomfort, may be present during physical activity but the individual may recall the event with positive feelings. Simply watching a televised sporting event and listening to the accompanying interviews provides support for this assertion. Thus, it was of interest to understand how participants and staff understand the affective experience of the exercise program. This was especially relevant due to the fact that the participants are not able to express themselves verbally. When compared to self-reports staff members inferred more neutral affect to the participants' expressions. Participants rated the photographs with a greater range and generally more positive ratings than staff; this may be one reason that in October and November staff members were quick to say that their

students did not enjoy physical activity. Even though the staff members were reliable in their ratings it is possible they were misinterpreting the student's expressions. Affect ratings by the parents of the students were closer to the self-ratings. This may be due to the close relationship experienced over many years, not the case for teachers and teaching assistants. This result emphasizes the importance of eliciting self reports rather than relying on proxy information (Payne & Jahoda, 2004; Wehmeyer, 2005).

Enjoyment increased throughout the program for three participants. As students became familiar with the park and organization of the activity they indicated an increase in positive affect. When photographs from individual sessions were rated it was evident that enjoyment also increased throughout a given session, after thirty minutes of physical activity the students' expressions generally showed positive affect. Staff members consistently placed the photographs with bigger smiles later in the session, this was verified by the students own ratings. This finding suggests that it is important to allow the opportunity for enjoyment to occur. Judging if a student is enjoying an activity too quickly may not provide an accurate picture of the participants' experience, for instance Kyle rarely gave photographs taken at the beginning of a session a very positive rating, but photographs taken during the middle or at the end of the sessions were much more likely to be positive. Fieldnotes concur with these ratings as it often appeared that Kyle was apprehensive during the first five to ten minutes of the activity but then seemed to relax and enjoy the program, and this trend lasted for 27 sessions. It is important to allow time for students with ASD to adjust to transitions.

Though the present instructional strategy, which combined goal setting and self-monitoring during a walk/jog activity did not increase the distance completed during 30 minutes for 3 participants, it provided an opportunity to understand which aspects of the

program engaged the students. The intervention was effective in engaging all of the participants but different variables seemed important to different participants. Self-reports of affect by the participants with ASD suggested that the students enjoyed the walk/jog activity. Staff members tended to give the photographs of the participants more neutral affect ratings than the participants; this suggests that it is difficult to infer emotional understanding to facial expressions during physical activity, and self-reports should be obtained whenever possible. Recognition of the aspects of the program which engaged each student will allow future strategies to combine these elements to create more motivating programs.

References

- Abery, B., & Stancliffe, R. (2003). An ecological theory of self-determination: Theoretical foundations. In M. Wehmeyer, B. Abery, D. Mithaug, & R. Stancliffe (Eds.), *Theory in self-determination: Foundations for educational practice* (pp. 25–42). Springfield, Ill: Charles C Thomas.
- Agran, M., Sinclair, T., Alper, S., Cavin, M., Wehmeyer, M., & Hughes, C. (2005). Using self-monitoring to increase following-direction skills of students with moderated to severe disabilities in general education. *Education and Training in Mental Retardation and Developmental Disorders*, 40, 313.
- Alberto, P., & Troutman, A. (2006). *Applied behavior analysis for teachers* (7th ed.). Hillsdale, NJ: Merrill Prentice Hall.
- American Psychiatric Association. (1994). *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV) (4th edition). Washington DC: Author.
- Anton, S., Perri, M., Riley, J., Kanasky, W., Rodrigue, J., Sears, S., & Martin, D. (2005). Differential predictors of adherence in exercise programs with moderate versus higher levels of intensity and frequency. *Journal of Sport & Exercise Psychology*, 27, 171-187.
- Bandura, A. (1997). *Self-Efficacy: The exercise of control*. New York: W.H. Freeman & Co.
- Bastard Rosset, D., Rondan, C., Assouline, B., Clement, M., Da Fonseca, Deruelle, C. (2006). *Typical emotion processing for cartoon but not for real faces in children with autism*. Poster session presented at the annual meeting of the International Meeting For Autism Research, Montreal, Quebec.

- Booth, T., & Booth, W. (2003). In the frame: photovoice and mothers with learning difficulties. *Disability & Society*, 18, 431-442.
- Brantlinger, E., Jimenez, R., Klinger, J., Pugach, M., & Richardson, V. (2005). Qualitative studies in special education. *Exceptional Children*, 71, 195-207.
- Canadian Fitness and Lifestyle Institute. (2002). *2002 Physical Activity Monitor*. Retrieved January 15, 2004, from <http://www.cflri.ca/eng/statistics/surveys/pam2002.php>
- Carnahan, C. (2006). Photovoice: Engaging children with autism and their teachers. *Teaching Exceptional Children*, 39(2), 44-50.
- Cleary, T., & Zimmerman, B. (2004). Self-regulation empowerment program: A school-based program to enhance self-regulated and self-motivated cycles of student learning. *Psychology in the School*, 41, 537-550.
- Creswell, J., & Clark, V. (2007). *Designing and Conducting Mixed Methods Research*. Thousand Oaks, CA: Sage.
- Dacey, M. (2004). Exercise motivations inventory-revised (EM1-2) applied to older adults: Exploratory factor analysis. *Research Quarterly*, 75, 38-39.
- Drast, P., Zakrajsek, D., & Mancini V. (1985). *Analyzing physical education and sport instruction*. Champaign, IL: Human Kinetics.
- Deci, E., & Ryan, R. (2000). The "What" and "Why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, 11, 227-268.
- Denzin, N. & Lincon, Y. (2003). *Strategies of Qualitative Inquiry* (2nd edition). Thousands Oaks, CA: Sage.

- Fallon, E., Hausenblas, H., & Nigg, C. (2005). The transtheoretical model and exercise adherence: examining construct associations in later stages of change. *Psychology of Sport and Exercise*, 6, 629-641.
- Fitzpatrick, D. & Watkinson, J. (2003). The lived experience of physical awkwardness: Adult's retrospective views. *Adapted Physical Activity Quarterly*, 20, 279-297.
- Frank, M., Ekman, P., & Friesen, W. (1993). Behavioral markers and reconcilability of the smile of enjoyment. *Journal of Personality and Social Psychology*, 64, 83-93.
- Freire, P. (1972.) *Cultural Action for Freedom*. New York: Penguin.
- Ganz, J., & Sigafoos, J. (2005). Self-monitoring: Are young adults with MR and autism able to utilize cognitive strategies independently? *Education and Training in Developmental Disabilities*, 40, 24-33.
- Giovannelli, J., Strauss, M., Best, C., Newell, L., Rump, K., Turner, K., & Minshew, N. (2005). *Face processing abilities in young children with autism & Asperger's syndrome*. Poster presentation at the annual meeting of the International Meeting for Autism Research, Boston, MA.
- Goodwin, D., & Compton, S. (2004). Physical activity experiences of women aging with disabilities. *Adapted Physical Activity Quarterly*, 21, 122 – 138.
- Goodwin, D., & Staples, K. (2005). The meaning of summer camp experiences to youths with disabilities. *Adapted Physical Activity Quarterly*, 22, 146 – 159.
- Havercamp S. (2002). Health indicators 2000-2001: A Part of the North Carolina Core Indicators Project. The Center for Development and Learning University of North Carolina at Chapel Hill. Retrieved on Feb.22, 2006 from <http://72.14.203.104/search?q=cache:kfwXUB4xLMgJ:www.fpg.unc.edu/~ncodh/Wo rddocs/Health%2520Indicators%2520Project%2520Summary->

[%2520Community%2520MRC%2520%2701-%2702.doc+health+indicators+2000-2001&hl=en&ct=clnk&cd=5&gl=ca](#)

- Human Resources and Skill Development Canada. (2004) Advancing the Inclusion of People with Disabilities 2004. Retrieved on March 19, 2005 from <http://www.hrsdc.gc.ca/en/hip/odi/documents/advancingInclusion04/toc.shtml>
- Johnson, B., & Turner, L. (2003). Data collection strategies in mixed methods research. In A. Tashakkori & C. Teddlle (Eds.), *Handbook of mixed methods in social & behavioral research* (pp. 297 – 320). Thousand Oaks, CA: Sage.
- Joseph, R., & Tanaka, J. (2003). Holistic and part-based face recognition in children with autism. *Journal of Child Psychology and Psychiatry*, 44, 529 – 542.
- Kennedy, C. (2005). *Single-case designs for educational research*. Boston: Allyn and Bacon.
- Koegel, R., Koegel, L., & McNerney, E. (2001). Pivotal areas in intervention for autism. *Journal of Clinical Child Psychology*, 30, 19- 32.
- Latham, G., Winters, D., & Locke, E. (1994). Cognitive and motivational effects of participation: A mediator study. *Journal of Organizational Behavior*, 15, 49-63.
- Lensmire, T. (1998). Rewriting student voice. *Curriculum Studies*, 30, 261-291.
- Locke, E., & Latham, G. (2002). Building a practically useful theory of goal setting and task motivation. *American Psychologist*, 57, 705-717.
- Lombard, D., Lombard, T., & Winett, R. (1995). Walking to meet health guidelines: The effect of prompting frequency and prompt structure. *Health Psychology*, 14, 164 – 170.
- Lykes, J.M. (2001). Creative arts and photography in participatory action research in Guatemala. In P. Reason & H. Bradbury (Eds.), *Handbook of action research: Participatory inquiry and practice* (pp. 363-371). Thousand Oaks, CA: Sage.

- McAuley, E., Jerome, G.J., Elavsky, S., Marquez, D.X., & Ramsey, S.N. (2003). Predicting long-term maintenance of physical activity in older adults. *Preventive Medicine*, 37, 110-118.
- Ministere de l'Education de Quebec. (1996). *Guide de la declaration d'effectif scolaire des jeunes en formation generale*. Quebec: Direction de l'adaptation scolaire et des services complementaire.
- Mitchell, C. & Allnutt, S. (in press). Photos that talk: Working with photographs as objects and things to create social documentary. In J. Knowles & A. Cole (Eds.) *Handbook of the arts in qualitative research: Perspectives, methodologies, examples, and issues*.
- Mithaug, D., Wehemyer, M., Agran, M., Martin, J., & Palmer, S. (1998). The Self-determined Learning Model of Instruction: Engaging students to solve their learning problem. In M. Wehmeyer & D. Sands (Eds.), *Making it Happen: Student involvement in education planning, decision making and instruction* (pp.299-328). Baltimore: Paul H. Brookes.
- Oman, R.F. & King, A.C. (1998). Predicting the adoption and maintenance of exercise participation using self-efficacy and previous exercise participation rates. *American Journal of Health Promotion*, 12, 154-161.
- Osterling, J.A., Dawson, G., & Munson, J. (2002). Early recognition of 1-year-old infants with autism spectrum disorder versus mental retardation. *Development and Psychopathology*, 14, 239-251.
- Payne, R. & Jahoda, A. (2004). The Glasgow Social Self-Efficacy Scale – A new scale for measuring social self-efficacy in people with intellectual disability. *Clinical Psychology & Psychotherapy*, 11, 265-274.

- Prupas, A., & Reid, G. (2001). Effects of exercise frequency on stereotypic behaviors of children with developmental disorders. *Education and Training in Mental Retardation and Developmental Disorders*, 36, 196 – 206.
- Renner, P., Klinger, L., & Klinger, M. (2000). Implicit and explicit memory in autism: Is autism an amnesic disorder? *Journal of Autism and Developmental Disorders*, 30, 3 – 14.
- Stancliffe, R., & Abery, B. (2003). An ecological theory of self-determination: Research evidence. In M. Wehmeyer, B. Abery, D. Mithaug, and R. Stancliffe (Eds.), *Theory in self-determination: Foundations for educational practice* (pp.79-118). Springfield, Ill: Charles C. Thomas.
- Stancliffe, R., Abery, B., Springborg, H., & Elkin, S. (2000). Substitute decision-making and personal control: Implications for self-determination. *Mental Retardation*, 38, 407-421.
- Todd, T., & Reid, G. (2004). *Does the Picture Tell the Story? Visual Analysis of students with ASD during Physical Activity*. Paper presented at the bi-annual International Symposium for Adapted Physical Activity. Verona, Italy.
- Todd, T., & Reid, G. (2006). Increasing physical activity in individuals with autism. *Focus on Autism and Other Developmental Disabilities*, 21, 167-176.
- Wang, C. (2005). Methods. In Photovoice Social Change Through Photography (section 2). Retrieved Dec. 15, 2005, from <http://www.photovoice.com>
- Wang, C., & Burris, M. (1994). Empowerment through Photo Novella: Portraits of participation. *Health Education Quarterly*, 21, 171 – 186.
- Wang, C., & Burris, M. (1997). Photovoice: Concept, methodology, and use for participatory needs assessment. *Health Education & Behavior*, 24, 369-387.

- Weber, J., & Wernheim, E.H. (1989). Relationship of self-monitoring, special attention, body fat percentage, and self-motivation to attendance at a community gymnasium. *Journal of Sport & Exercise Psychology*, 11, 105 -111.
- Webster's New World Dictionary and Thesaurus (1996). New York: Macmillan.
- Wehmeyer, M. (2005). Self-determination and individuals with severe disabilities: Re-examining meanings and misinterpretations. *Research & Practice for Persons with Severe Disabilities*, 30, 113-120.
- Wehmeyer, M., Abery, B., Mithaug, D., & Stancliffe, R. (2003). *Theory in self-determination: Foundations for educational practice*. Springfield, Ill: Earlbaum.
- Wilson, P., Rodgers, W., Frader, S., & Murray, T. (2004). Relationships between exercise regulations and motivational consequences in university students. *Research Quarterly for Exercise and Sport*, 75, 81-91.



Figure 1 Self-monitoring / Goal setting board

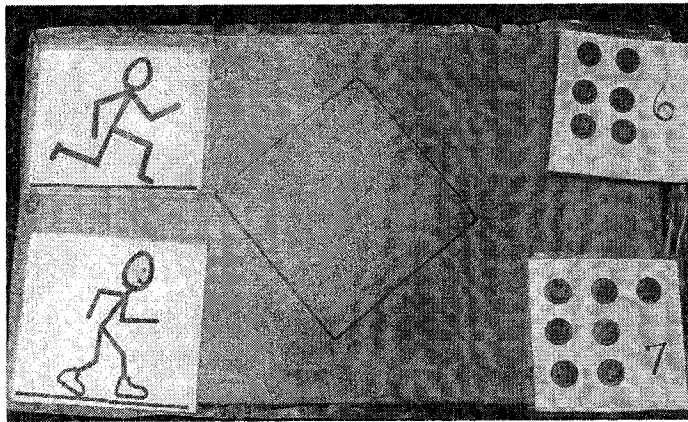


Figure 2: Goal setting card

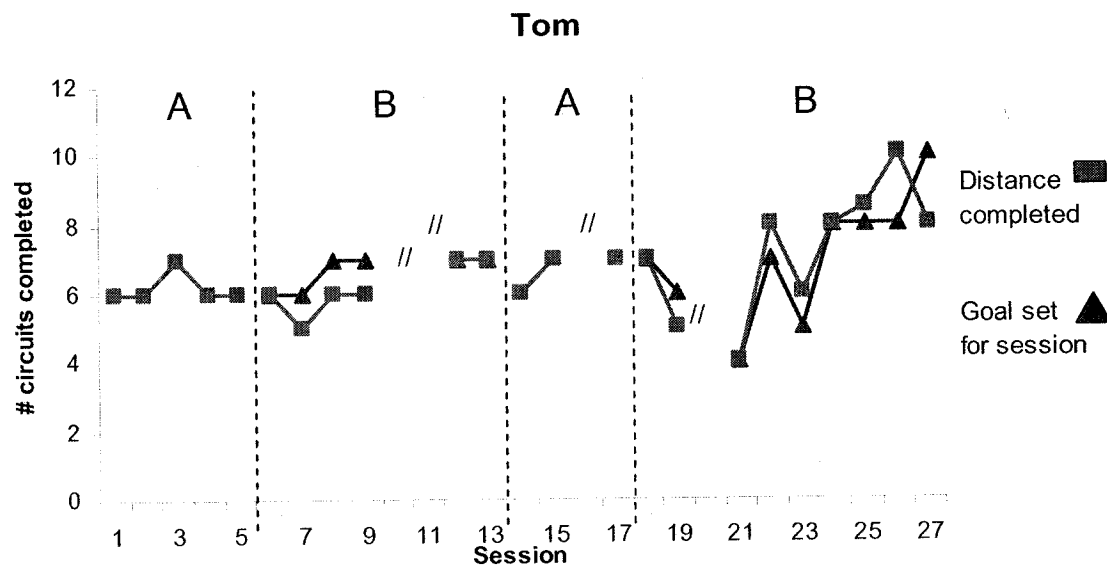


Figure 3. Distance Tom walked/jogged over 27 sessions. During Phase A, baseline, Tom self-monitored his distance. Goal setting and self-monitoring took place during Phase B.

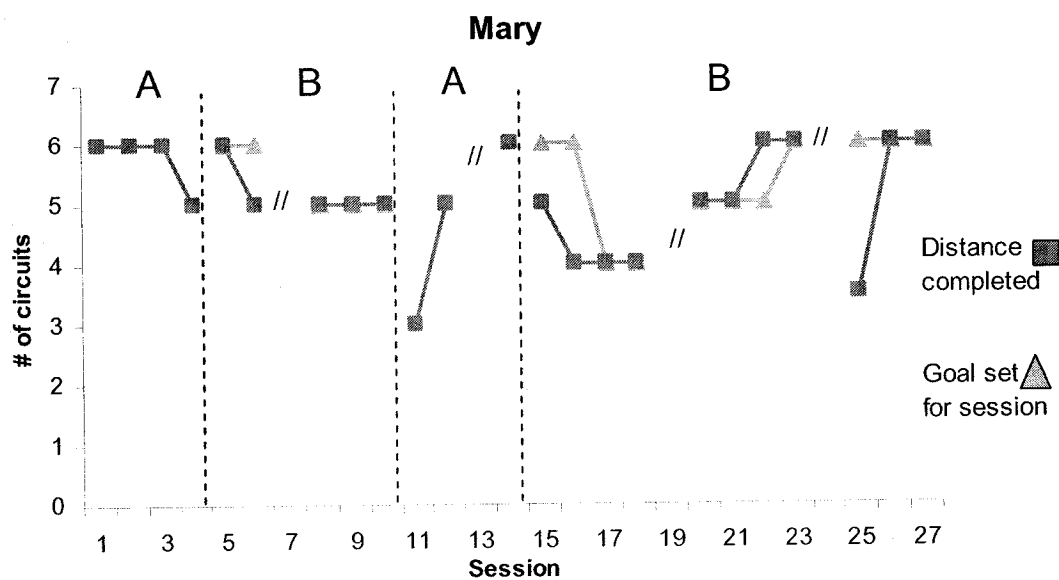


Figure 4. Distance Mary walked/jogged over 27 sessions. During Phase A, baseline, Mary self-monitored her distance. Goal setting and self-monitoring took place during Phase B.

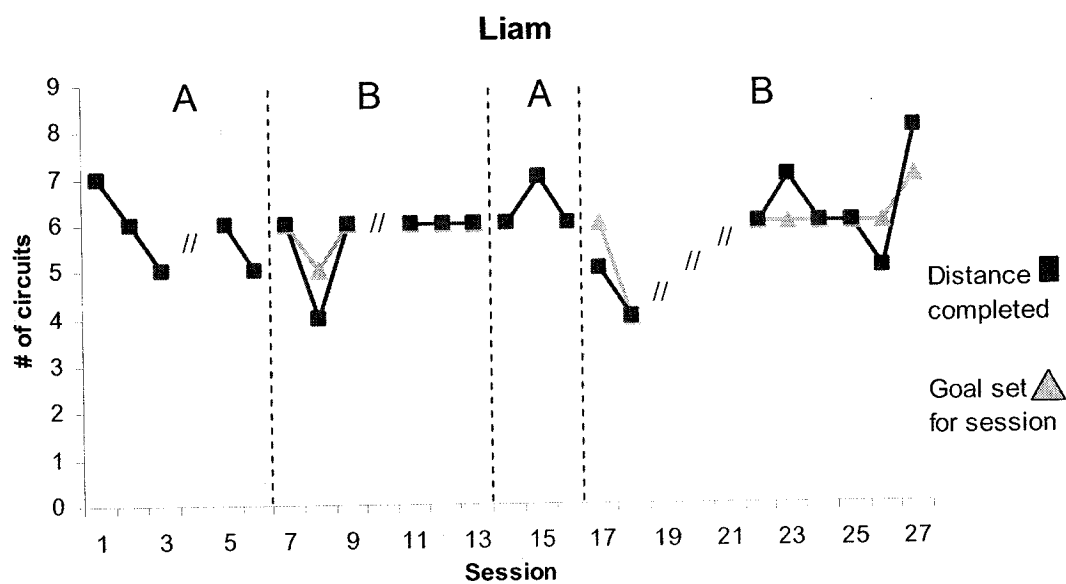


Figure 5. Distance Liam walked/jogged over 27 sessions. During Phase A, baseline, Liam self-monitored his distance. Goal setting and self-monitoring took place during Phase B.

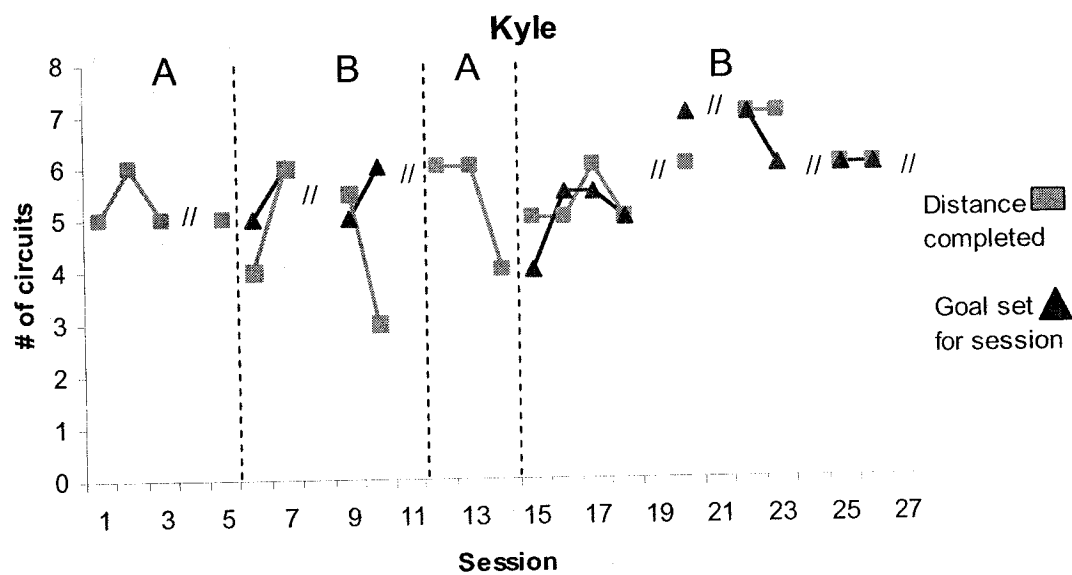


Figure 6. Distance Kyle walked/jogged over 27 sessions. During Phase A, baseline, Kyle self-monitored his distance. Goal setting and self-monitoring took place during Phase B.

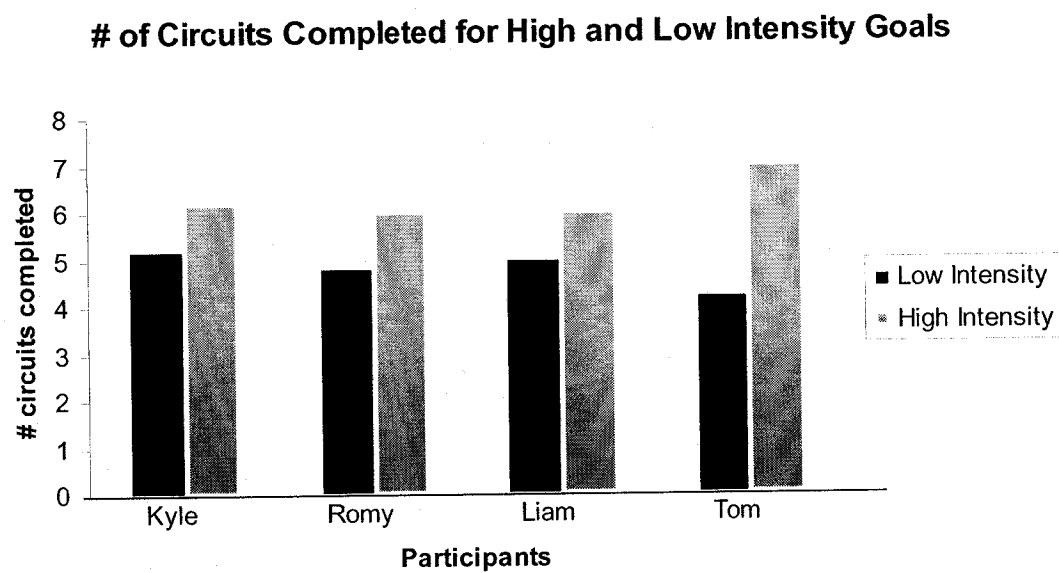


Figure 7. Number of circuits completed when participants selected the low intensity goal and the high intensity goal.

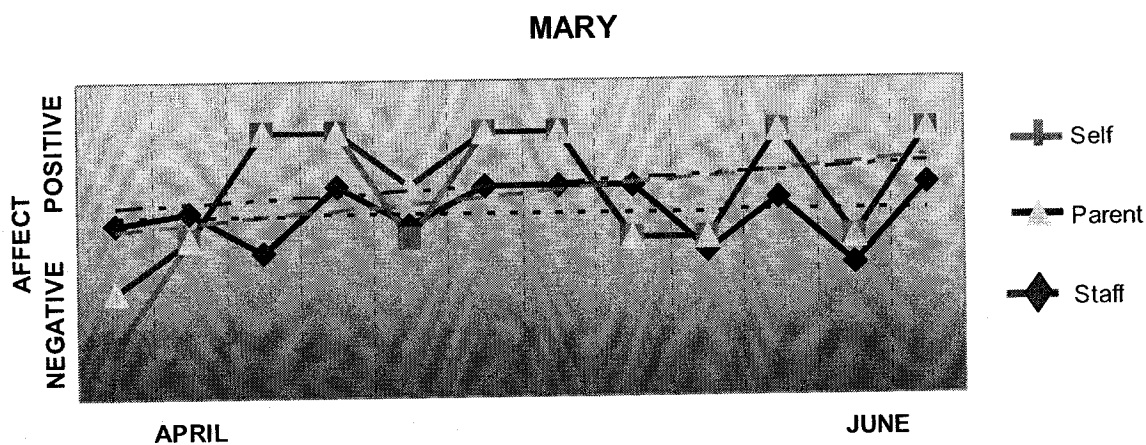


Figure 8. Photographs of Mary rated from positive to negative affect by Mary, her parent, and five staff members. Trend lines show that Mary's affect became more positive throughout the program.

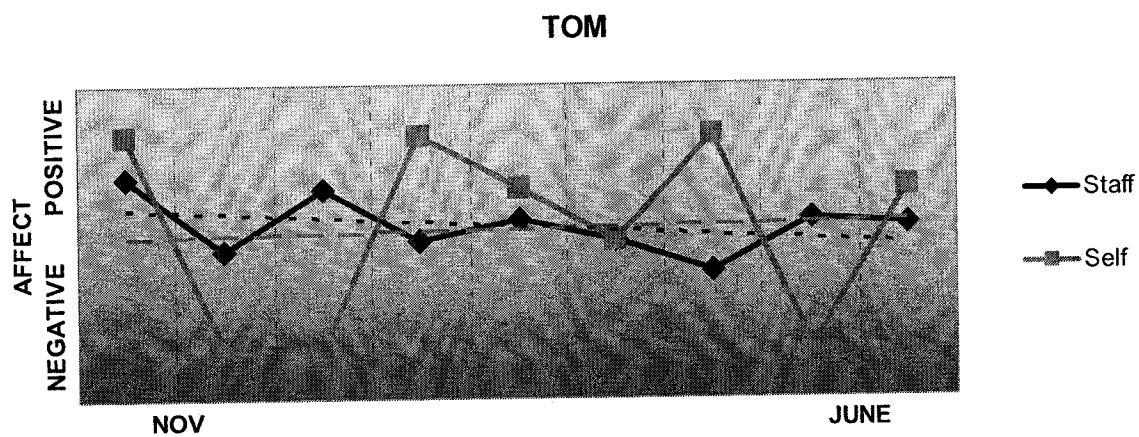


Figure 9. Photographs of Tom rated from positive to negative affect by Tom, and five staff members. Trend lines show that Tom's affect was stable throughout the program.

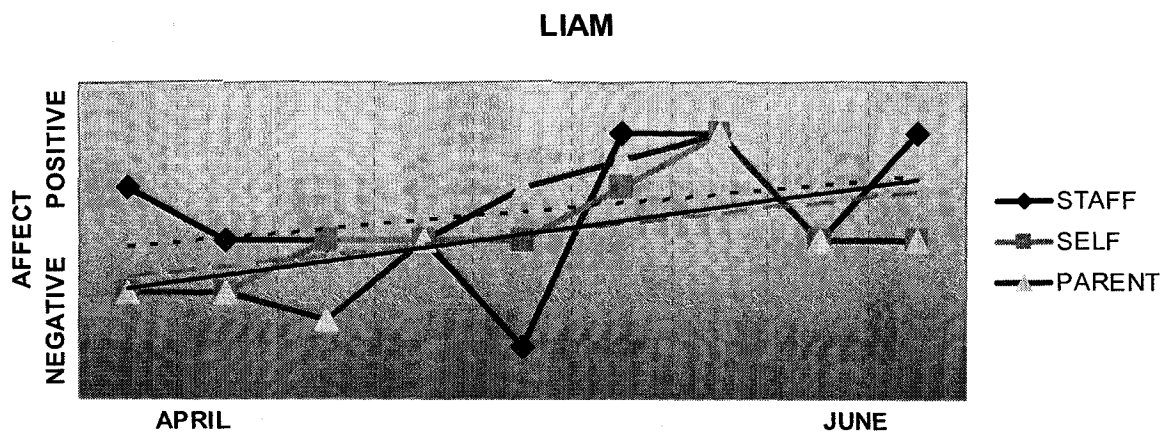


Figure 10. Photographs of Liam rated from positive to negative affect by Liam, his parent, and five staff members. Trend lines show that Liam's affect became more positive throughout the program.

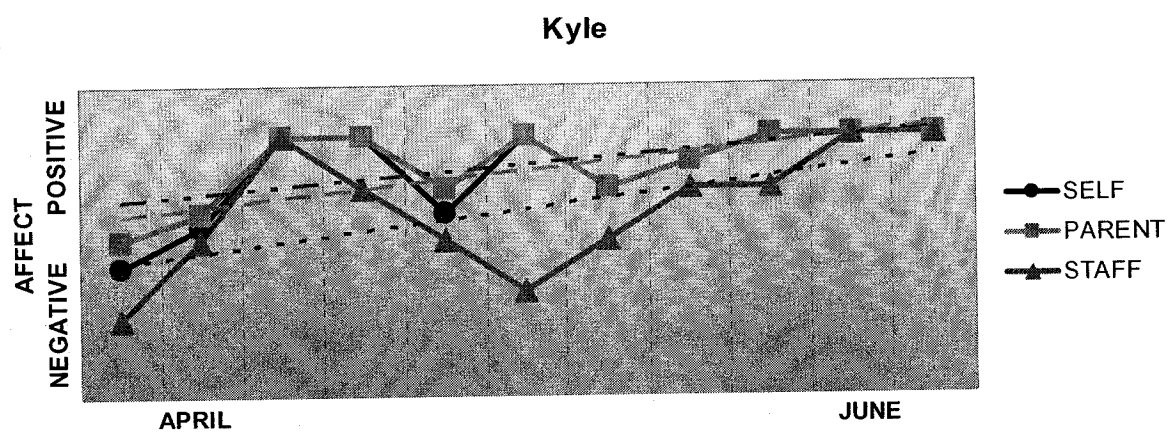


Figure 11. Photographs of Kyle rated from positive to negative affect by Kyle, his parent, and five staff members. Trend lines show that Liam's affect became more positive throughout the program.

Bridging Manuscripts and Contributing Authors

Chapter 4 presents the final part of this three study doctoral dissertation. Building on the previous two studies during which interventions were based on one and then two component elements of self-determination, the next intervention consists of three self-determination skills: self-monitoring, goal-setting, and self-reinforcement. Self-regulation, a component of self-determination, is composed of these three skills. This study is based on The Tripartite Ecological Theory of Self-determination which suggests that individuals need certain knowledge, attitudes, and skills to behave in a self-determined manner. This differs from studies 1 and 2 which focused on skills. The next study attempted to track the development of the attitude of self-efficacy through a visual representation of a question about self-efficacy developed for this group of participants with ASD and severe communication problems. This was also a mixed methods design; quantitative data consisted of distance cycled and information on goal-setting accuracy. Qualitative data were derived from albums created by the participants using photographs taken during the cycling activity. The act of choosing and placing the photographs in the albums allowed the participants creativity and personal control.

Dr. Reid was involved in choosing the design of the study, as first author I set up and supervised the physical activity, collected and analyzed data, and wrote the manuscript. Dr. Reid edited the manuscript and was available for consultation during of the study. Dr. Lynn Butler-Kisber was consulted for expertise on visual methodologies; she provided feedback during the analysis of the photograph albums. The relative contributions of the authors was 85% myself, 10% Dr. Reid, and 5% Dr. Butler-Kisber.

Chapter 4

Cycling for students with ASD: Self-regulation, self-efficacy, storytelling

Teri Todd, Greg Reid, and Lynn Butler-Kisber

Abstract

This study investigated the effect of a self-regulation instructional strategy, on the distance cycled by three adolescents with autism spectrum disorder. The participants' self-efficacy was assessed throughout the program using visual aids. Efficacy appeared to increase as participants cycled and used self-regulation skills. Goal-setting accuracy also increased. Photographs were taken during the program and participants created photograph albums of their experience. The albums told stories; this visual methodology became an avenue for the participants to engage in storytelling with their teachers. Listening to the 'voice' of the participants strongly suggested that they enjoyed the activity and by the end of the 16 week program were regularly completing 30 minutes of cycling.

Cycling for students with ASD: Self-regulation, self-efficacy, storytelling

Sedentary lifestyles and obesity rates are on the rise in today's society. Over 67% of people with disabilities lead sedentary lives, thus increasing the risk of serious health problems (Human Resources and Skill Development Canada, 2004). Individuals with autism spectrum disorders (ASD) often have difficulty participating in physical activities for a myriad of reasons. Low levels of motor skills (Berkeley, Zittel, Pitney, & Nichols, 2001), difficulty planning motor actions (Smith, 2000), poor generalization across activities (Ozonoff, Strayer, McMahon, & Filloux, 1994; Renner, Klinger, & Klinger, 2000), problems adapting to open environments (Motttron et al., 2007), and low motivation (Johnson, Yechiam, Murphy, Queller, & Stout, 2006) can make participation in physical activity less than appealing.

Current guidelines recommend that 30 minutes of moderate physical activity five times a week will provide substantial health benefits (U.S. Department of Health and Human Services, 1996). Unfortunately 50% of people who begin a physical activity program stop attending within six months (Fallon, Hausenblas, & Nigg, 2005), which is being addressed in a research domain of health psychology with adherence theory (e.g. Anton et al., 2005; Wilson et al., 2004). There is little research about adherence theory for people with disabilities. Increasing participation in physical activity is important for individuals with ASD for typical health benefits, and exercise decreases stereotypic behavior at least temporarily (Prupas & Reid, 2001; Todd & Reid, 2004) thereby allowing on-task behavior to increase.

There is much to learn about promoting physically active lifestyles for people with or without disabilities. Anton and colleagues (2005) suggest that matching interventions to participants may be one method to improve participation. They suggest that understanding the

determinants of physical activity within different groups of the general population, in combination with psychological theories and models, will improve the development of strategies designed to increase physical activity. For the past two decades Wehmeyer and colleagues have evaluated interventions, based on self-determination theory. Self-determination theory has successfully guided curriculums for engagement in education, transition, and vocational programs for students with intellectual disability and ASD (Mithaug, Mithaug, Agran, Martin & Wehmeyer, 2003). Therefore interventions which increase self-determined behavior during physical activity may be one way of promoting regular participation. In particular an ecological perspective of self-determination guided the intervention in the current study (Abery, Rudred, Arndt, Schauben & Eggebeen, 1995; Abery & Stancliffe, 2003).

Self-determination refers to acting as the causal agent in one's life (Wehmeyer, 1998). The Tripartite Ecological Theory of Self-determination is based on a three part model which purports that self-determined behaviour is influenced by knowledge, attitudes, and skills (Abery & Stancliffe, 2003). Knowledge is a result of the society one lives in, it consists of knowing the laws of a given time as well as self-knowledge. For example, knowledge of individual rights as defined in Canadian Charter of Rights and Freedoms (Department of Justice, 1982) is important in realizing if one's rights have been violated. Knowledge of one's rights may also refer to understanding that each person has the right to food and safety. Attitudes refer to personal capacities, self-efficacy, self-esteem, locus of control, and attributions of success and failure. These capacities are often essential to skills such as goal-setting, problem solving, self-monitoring, and choice making which are required to act in a self-determined manner. Therefore it is important that people possess knowledge and attitudes

that will enable them to act in a self-determined manner, for instance one requires a certain degree of self-efficacy to set a realistic goal.

Individuals with severe disabilities may lack the knowledge, attitudes, and skills to act in a self-determined manner even if they have the opportunity to act on their own desires. Wehmeyer (2005) succinctly pointed out that simply providing opportunities to be self-determining is not beneficial if individuals do not possess the knowledge and attitudes required. In an earlier physical activity study by Todd and Reid (2007) an instructional strategy based on two self-determination skills, self-monitoring and goal-setting, was introduced to students with severe ASD. The students learned to self-monitor but goal-setting was only accurate 53% of the time. One possible explanation was that the participants did not possess the required attitudes to engage in the skill of goal setting. Therefore the present study has undertaken to explore one attitude, self-efficacy.

Bandura (1986;1997) studied self-efficacy as a critical element of Social Cognitive Theory. This theory purports that one's efficacy beliefs are a major basis of action. The constructs proposed by social cognitive theory have been supported in the exercise literature (e.g. Bozian, Rejeski, & McAuley, 1994; McAuley & Blissmere, 2000; Moritz, Feltz, Fahrbach, & Mack, 2000; Treasure & Newberry, 1998). There has been little research on this construct for people with severe disabilities (Payne & Jahoda, 2004).

Social cognitive theory suggests that people select actions based on reasoned plans and foresight of the consequences of their actions. An important element of this theory is self-efficacy. Self-efficacy refers to "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3). Efficacy influences what a person chooses to do, how much effort he or she expends doing it, and how

long a person will persevere at a task in the face of obstacles (Bandura, 1997). All of these elements are important in setting, and acting towards, personal goals. In addition, efficacy beliefs about certain situations can develop and change throughout one's life.

Assessing self-efficacy in people with disabilities has been problematic, in large part due to communication difficulties. Nonetheless the construct of self-efficacy has been found to influence the actions of people with mild disabilities (Payne & Jahoda, 2004; Slemon, 1998). A major difficulty in measuring self-efficacy for people with developmental disabilities is obtaining accurate information. Efficacy is usually assessed by completing a questionnaire describing one's belief of being able to obtain a certain outcome at a given moment in time (Moritz et al, 2000). This type of report is difficult to obtain for people with developmental disabilities. Some believe that self-reports by people with developmental disabilities may be unreliable (Payne & Jahoda, 2004, Wehmeyer, 2005), while others feel that communication difficulties render self-reporting impossible for people with communication challenges (Stancliffe & Abery, 2003). Some studies have collected information about a participant from parents, caretakers, and significant others, which are known as proxy reports. Proxy reports have been used to assess self-efficacy and other personal control variables. One advantage of proxy reports is that information can be obtained about all individuals; a major drawback is that current analyses have found only moderate agreement between proxy and self-reports on personal control, choice, and other quality of life variables (Stancliffe & Abery; Wehmeyer & Metzler, 1995). Self-reports of affect and emotion have been collected from individuals with mild to moderate intellectual disabilities with promising results, in fact, Lindsay and colleagues found an impressive degree of consistency on several measures of anxiety and depression for 67 men and women (Lindsay,

Michie, Baty, Smith & Miller, 1994). These results emphasize that self-reports are not only possible for people with disabilities, but provide the most accurate information. Following current trends in self-determination research, a priority was placed in refining assessments tools to make them accessible to all people with disabilities, even those with severe communication difficulties. Careful refinement of question format and wording, the use of pictorial formats, and evaluating a person's understanding of the questions and the response format, have been recognized as important advances in enabling people with severe disabilities to be included in research endeavours (Stancliffe & Abery). All of these techniques were combined to create a tool to assess self-efficacy directly for the participants in the present study.

Bandura (1997) suggests that many of the efficacy supports required for participation in physical activity come from our knowledge of self-regulation. Strategies which incorporate elements of proximal goal-setting, self-monitoring and supportive feedback build a sense of physical self-efficacy. Furthermore, Bandura states that "the elements of self-regulation must be enlisted together rather than piecemeal to achieve good results" (1997, p. 415).

Thus, an intervention based on self-regulation skills was designed to promote engagement in a cycling program for students with ASD, in part, by increasing self-efficacy beliefs of the participants. Self-regulation strategies are multi-component interventions which aim to teach skills that will increase autonomy (Wehmeyer, Yeager, Bolding, Agran, & Hughes, 2003), and usually include from two to four components. The intervention used in the present study included goal-setting, self-monitoring, and self-reinforcement. Supportive feedback was provided verbally during the program and edible reinforcers, which were used within the school to signify a good result, were available during the program. Children

without disabilities learn many of these skills during childhood, but individuals with severe disabilities typically lack the skills to self-regulate and need to be taught the skills directly (Koegel, Koegel, & McNeerney, 2001).

Goal setting has received considerable attention as a strategy to motivate people in work and school environments (Locke & Latham, 1990; 2002; Columbus & Mithaug, 2003). In fact, Bandura (1997) hypothesized that for a goal to be effective in increasing self-efficacy it must influence motivation. Goals that are specific, realistic, and proximal are most effective. The influence of goal setting is bi-directional, when goals are met efficacy can increase and efficacy beliefs influence the level at which a goal is set. For instance, if a goal is met, efficacy beliefs increase and the person may set a goal of equal or increased difficulty next time. On the other hand, if a goal is not met, efficacy beliefs may decrease and the person will set an easier goal at the next opportunity.

In conjunction with goal setting, self-monitoring is critical to developing physical self-efficacy. Self-monitoring refers to the process of systematically gathering information about a target behavior without use of external controls (Ganz & Sigafoos, 2005; Martin & Anshel, 1995). During the act of self-monitoring a person detects the occurrence of an event and records it (Ganz & Sigafoos; Wehmeyer, 2005). Students who self monitor may also learn to discern when their target goal has been reached, thereby engaging in self-evaluation of their performance. Self-evaluation can be operationally defined as the student comparing his or her performance, based on self-monitored records, to a desired goal, standard, or outcome (Agran & Wehmeyer, 2006). It is an important skill that allows an individual to be aware of personal progress towards a goal which may also be reinforcing. The act of self-evaluation expands the act of self-monitoring from a frequency tally to an informed judgment (Agran &

Wehmeyer). This skill promotes independence as the student is not reliant on another person to obtain desired information and has been used successfully in educational environments for students with developmental disabilities (Wehmeyer, et al., 2003).

Wehmeyer (1998) defined self-reinforcement as immediate reinforcement following the occurrence of a desired behavior. Two activities must be carried out: discrimination of goal achievement and delivery of the reinforcer (Agran & Wehmeyer, 2006). Self-reinforcement acts to shift control of the consequences in a learning situation from the teacher to the student, this provides considerable potency to self-regulation (Agran & Wehmeyer).

Traditionally, learning environments have been controlled by teachers or parents and students have played a passive role, this is particularly true for students with disabilities. Providing opportunities for self-regulation may seem foreign and possibly overwhelming to students during the first weeks of a program. With careful planning so that early experiences produce positive outcomes, students will begin to understand that they can take control of their actions. Self-regulation strategies have proven effective for students with disabilities for academic and vocational tasks (Agran, Blanchard, Wehmeyer, & Hughes, 2002; McDougall & Brady, 1998; Wehmeyer et al., 2003). Interventions which increase self-regulation skills and provide progressive mastery experiences will strengthen an individual's beliefs of their physical capabilities (Bandura, 1997). As perceived efficacy strengthens, and one's sense of personal accomplishment increases, there is greater interest and enjoyment in the physical activity (McAuley, Courneya, & Lettunich, 1991) and greater adherence to regular participation.

Experiencing positive affect during a physical activity will also act to strengthen ones belief of physical efficacy (McAuley, Shaffer, & Rudolph, 1995). Individuals with a high

sense of efficacy experience more enjoyment than people with low self-efficacy and are more likely to be engaged in the activity (Bandura, 1997; Bandura, Caprara, Barbaranelli, Gerbino, Pastorelli, 2005). Like self-efficacy, feelings of enjoyment are difficult to evaluate in individuals who have severe communication difficulties, however visual methodologies are one avenue which enable these individuals to share their feelings (Todd & Reid, 2004). The present study used a visual methodology to explore the participants' subjective experience during a cycling program. This information is valuable when assessing the effectiveness of the intervention.

The purpose of this mixed method study was to design and assess an intervention to promote regular, sustained physical activity through the use of goal-setting, self-monitoring, and self-reinforcement during a cycling activity for three adolescents with ASD. The students' self-efficacy was assessed regularly to understand the relationship among perceived efficacy, goal setting, self-monitoring, and the experience of the students during the activity. Photographs were taken during the activity and students created photograph albums of their experience. The photograph albums were analyzed using an adaptation of the PhotoVoice methodology (Wang & Burris, 1997).

Method

Participants

Three students, one female and two male, aged 15 – 17 years, participated in a cycling program. Lisa, Mark, and Daniel attended a school for students with moderate to profound intellectual disabilities. The three students also had a primary diagnosis of autism. The students were non-verbal and communicated using pictograms. Participants were recommended for the cycling program by the physical educator and the classroom teacher on

the basis of physical ability. The school administrators obtained permission for the students to partake in physical activity. Parental permission was obtained to use photographs for research purposes.

Lisa and Mark were categorized as having autism according to the guidelines of the Ministère de l'Éducation de Québec's Guide de la Déclaration d'Effect Scolaire des Jeunes en Formation Générale (DCS; Ministère de l'Éducation de Québec, 1996). This code for autism is given to individuals who meet the Diagnostic and Statistical Manual of Mental Disorders-Fourth Edition (DSM-IV; American Psychiatric Association, 1994) guidelines for autism as diagnosed by a multidisciplinary team in conjunction with a psychiatrist. Daniel had recently moved into the school district and was being evaluated by a multi-disciplinary team. The psychologist on the team verified that Daniel would be categorized as autistic at the beginning of the next school year. Specific details of the participants' cognitive abilities were not available; all of the participants attended a school for students with an intellectual disability, and therefore were considered to have autism and intellectual disability.

The three students were members of a class based on the floor time approach which encourages teachers to follow the lead and interests of the student (Greenspan & Wieder, 1998). Daily activity schedules were posted for each participant though the teacher was flexible and adjusted the schedule to follow the students' preferences.

Lisa was 16 years old and an easy going student who was eager to participate in physical activity. She was non-verbal and communicated with pictograms. Lisa had a short attention span and had difficulty completing table-based work tasks. She spent most of the day wandering around the classroom. A pictogram of a tricycle was placed on her daily schedule on the days the program took place, Lisa would check her schedule after lunch and if

the tricycle was there she would wait at the classroom door until it was time to go to the activity. Cycling was an easy skill for Lisa to learn though she did have to overcome some initial steering difficulties. With practice Lisa could navigate the course without difficulty.

Mark, 17 years old, attended the same class as Lisa and Daniel. Like Lisa, he was often waiting at the door when it was time for the cycling activity. Mark was non-verbal and communicated with pictograms using PECS, Picture Exchange System. Mark had scoliosis and an uneven gait. He enjoyed many sensory activities such as hammock swings, hydrotherapy, and the Snozoelen room. Once at the gymnasium or in the school yard, he ran to his favorite red tricycle and claimed it for his own.

Daniel was the youngest participant at 15 years old. He was small in stature and had the appearance of a younger child. Daniel enjoyed playing ball outside and was quite skilled at kicking, throwing, and catching; his parents reported that he enjoyed playing ball with his siblings. Riding a bicycle was a new task for Daniel; he appeared interested in the cycling activity and was able to steer accurately within the first few sessions. Daniel communicated through several hand signals and pictograms. He joined the activity readily most days; he preferred to be outside and would often point out the window to the school yard on rainy days.

Activity

A cycling activity was carried out three days per week during school hours from March to June. The circuit was set up in the fenced school yard when weather permitted. When the weather was rainy the cycling circuit was moved inside the school. Cycling is a culturally normative activity in which students can engage with peers and family members. The activity is well suited to individuals with autism and intellectual disability as it can be performed on an individual or group basis, is low skill when performed on a flat stable surface,

and is not dependent on the actions of others, unlike many games. Providing a closed environment reduces uncertainty and allows the students to attend to the task of cycling rather than other variables.

Mark and Daniel rode adult tricycles and Lisa rode a bicycle which was lower to the ground than a standard bicycle and had two stabilizing wheels. The adult tricycles were fitted with seats with back rests and seat belts, and the pedals had Velcro straps which fitted over the participants' shoes. All participants wore bicycle helmets during the program. Each session gave the opportunity to cycle for 30 minutes each session.

Lisa, Daniel, and Mark engaged in three self-regulatory skills during the cycling program, self-monitoring, goal-setting, and self-reinforcement. Self-monitoring was part of the program from the start to finish. Participants were introduced to goal-setting systematically, first setting intensity goals and setting later distance goals. Edible reinforcers were given to the participants during the first 12 sessions, after which the students took their own edible reinforcers.

Photographs were taken of the participants while they participated in the cycling activity. Following the cycling session Lisa, Daniel, and Mark chose photographs and placed them in individual photograph albums.

Activity circuit. The cycling course was set up on the asphalt part of the fenced school yard. Two orange pylons were placed 35 meters apart. Participants cycled from the pylon closest to the gymnasium doors to the second pylon, went around that pylon and returned to the first pylon always keeping the pylons on the left. A self-monitoring/goal setting board was placed on the fence directly in back of the first pylon. One circuit measured 75 meters.

The activity took place inside the school on rainy days. Two orange pylons marked the circuit; one was placed in the gymnasium and one at the end of an adjoining hallway. The students started at the pylon in the gymnasium, cycled around the gymnasium, down a hallway to the second pylon, turned around and returned to the gymnasium. The self-monitoring/goal setting board was hung on the gymnasium bars near the entrance from the hallway. One circuit measured 77 m., this was comparable to the outdoor circuit.

Self-monitoring board. A self-monitoring board of laminated poster board, 76.2 by 101.6 cm, was divided into vertical columns, the name of each participant written at the top of one column. Each name was written in a different colour which was coordinated with the markers placed on the board.

Small happy face markers indicating the participant's goal were placed on the left side of the column. The right side of each column was used for self-monitoring by the participants with large, 7.6 cm diameter, happy face markers. The colour of the markers matched the colour of the participant's name (Fig. 1).

Goal setting card. A laminated card, 15 cm x 37.5 cm, of green poster paper was prepared for each participant prior to the start of the session. Each card was designed to hold two pictograms, 10 cm x 10 cm. During Phase B1 intensity pictograms were placed on the card. The high intensity, or fast, pictogram was a stick figure running, the low intensity, or slow, a stick figure walking. While the program was cycling the students understood the walk and run pictograms better than a slow and fast tricycle, so the walk/run stick figures were used for this study. Goal setting changed to distance goals during Phase B2, the number pictograms had a printed number and the corresponding amount of small markers. If a participant selected six, the square would have a number 6 and six small happy face markers on it.

Self-efficacy Questionnaire. Self-efficacy was assessed by asking two simple questions that could be answered with pictograms. A 20 cm x 28.75 cm paper was divided into three sections, the top section was 20 cm x 17.5 cm and was blank with a piece of Velcro in the middle of the space. A thick black line separated the top and bottom of the page, the bottom section was divided in two with a vertical thick black line in the middle of the page creating two squares 11.25 cm x 10 cm. Two pictograms were printed in the smaller squares on the lower half of the page, one agreeable cartoon figure depicted an affirmative answer such as “I can” or “I’m sure” and one figure looking unsure and questioning, this represented the answer “I don’t know” or “I am not sure I can” (Fig. 2). The students pointed to the figure which represented how they felt with regard to meeting the goal they set during the session.

Photographs. An adaptation of the PhotoVoice methodology was used in an attempt to add voice to the student experience (Wang & Burris, 1997). Traditionally, people take photographs and then give meaning to the pictures – verbally or written. As the participants in this study were not able to take photographs independently or give meaning verbally or in writing, we adapted the methodology. The researcher took the photographs with a digital camera. In addition, towards the end of the program a Polaroid camera was brought to the program and participants were encouraged to assist in taking photographs.

The participants were photographed from March until the end of the program in June using a Fujifilm FinePix A250 digital camera and a Polaroid camera. Photographs were taken of each student during all of the 30 minute cycling sessions. The photographs were labelled by date. Once each week, immediately following the cycling activity, the participants used the images to construct photograph albums of the activity.

Each student was given a 20 page, 8.5" x 11", hard cover photograph album with self adhesive pages. Each album was a different colour for easy identification. Pictograms used in the program, walk, run, "I can", "I'm not sure" as well as affect pictograms, positive, neutral, and negative, were available to be used in the photograph albums. Once a week, immediately after the cycling program, participants placed pictures in the albums.

Fieldnotes. At the end of each exercise session the weather, attendance, participant mood, and reflections on what had happened during the session were recorded. These field notes allowed the researcher to contextualize the photographs and distance cycled when later analyzing the data.

Trustworthiness. Trustworthiness was established by data triangulation, the researchers' prolonged field engagement, and explicit statement of researcher bias (Brantlinger, Jimenez, Klingner, Pugach, & Richardson, 2005; Creswell, 2007, Denzin & Lincoln, 2003). Trustworthiness addresses the credibility of the findings.

Triangulation of data was done through the use of various data sources: distance covered, self-efficacy ratings, goal setting, photograph albums, and fieldnotes. Viewing one phenomenon through various data sources helps establish trustworthiness and provides crystallization (Cresswell & Clark, 2007; Denzin & Lincoln, 2003). Janesick (2003) explained that social phenomena look different from various angles, similar to looking through a crystal, the view changes as the crystal turns. Richardson (1994) eloquently stated that

Crystallization, without losing structure, deconstructs the traditional ideal of "validity" (we feel how there is no single truth ...); and crystallization provides us with a deepened, complex, thoroughly partial, understanding

of the topic. Paradoxically, we know more and doubt what we know. (p. 522)

Viewing physical activity from an objective side, distance cycled, and from a subjective vantage point, affective experience, is similar to looking at the same phenomenon through different facets of a crystal.

Credibility of the data was enhanced by the primary researcher's prolonged field engagement (Brantlinger et al., 2005). The researcher was involved with the physical education program in the school for three years; the change in the student population over this period was minimal. Interaction between the students in this study and the researcher was maintained over the three-year period, the researcher spent time in the students' classroom on a weekly basis during the cycling program. A positive rapport was established with the students prior to the start of the physical activity program.

The final component of trustworthiness for this study is a statement of researcher bias. As the primary author and researcher I am the parent of three children, one who has autism and attended the same school as the participants in the study, though not in the same class. I believe in the empowerment process and advocate for all people, with or without disabilities, to exercise self-determination skills. I have experience in the autism field at many levels, as an adapted physical activity professional I provided services to individuals with severe developmental disabilities. As a parent of a child with autism my family and I were recipients of a variety of services. This wide range of experience is beneficial when working with individuals with autism as I have personally dealt with many areas of concern for individuals with ASD and their families. I am able to see problems from several view points. This personal experience has made me very cognizant of the mismatch that commonly occurs between the participant and the program, often resulting in a frustrated participant. Therefore

this program was focused on creating a positive experience for each participant by progressing through the program at individual rates and encouraging each participant to take some control of the activity.

Design

A staggered baseline across subjects changing criterion design was used for this study. Single subject designs are commonly found in research with individuals who have severe developmental disabilities and research on self-determination skills. A meta-analysis of research studies of interventions to promote self-determination for individuals with disabilities reported that 25 of the 51 studies, which met criteria to be included in the meta-analysis, were single subject designs (Algozzine, Browder, Karvonen, Test, & Wood, 2001). Staggered baselines help demonstrate experimental control; in this case, the functional relation between the use of self-regulation skills, self-efficacy and changes in behavior was of interest (Alberto & Troutman, 2006). In addition, the staggered baselines gave the primary researcher a chance to spend more time on instruction with each participant when introducing goal setting.

A changing criterion design permitted each student to progress at his or her own pace and ensured that certain competencies were met before moving ahead to a more complicated or autonomous part of the program. Changing criterion designs are useful to track the effectiveness of instructional interventions on one element, in this case goal setting. Three phases were used in this study: i) phase A, baseline; ii) phase B, an instruction phase divided into two parts, phase B1, intensity goal setting, phase B2, distance goal setting; iii) phase C, maintenance. One aim of the program was to develop the attitude of self-efficacy and teach

self-regulatory skills; therefore demonstration of mastery of each goal setting phase was important.

Procedure

Activity. The activity took place three afternoons each week for 30 minutes. The area was prepared before the participants arrived; tricycles, bicycle, and helmets were parked at the start/finish point, the self-monitoring board was hung, the edible reinforcers were placed at the start/finish point, and the cycling circuit was marked by pylons. The primary researcher met the participants at the classroom and walked with them to the school yard or gymnasium depending on the weather.

The program began early March and continued until mid-June when classes finished. Thirty-one sessions were completed, 12 sessions were held indoors and nineteen outside. The first nine sessions were inside because the school yard was not dry and the weather was cool, three sessions during April and May were held inside because of rain. Two sessions were cancelled due to holidays and two for teacher study days. In addition Mark missed five sessions, 4, 12, 21, 25, and 28 due to scheduled hydrotherapy appointments, and Daniel was ill and could not participate for sessions 12, 16, 17 and 22.

One teaching assistant from the students' classroom accompanied Lisa, Mark and Daniel during each session. The teaching assistant supported the students if they needed to take a break, required warmer clothing, or needed to go inside for any reason.

Upon arriving at the cycling circuit the participants choose the bicycle or tricycle they wanted to ride, put on a helmet, and got on the cycle. The primary researcher and teaching assistant attached the lap belts and helmet straps. Once the students were securely seated they were able to begin the activity.

Edible reinforcers were given to the participants at the start/finish point as they completed each circuit, for the first 12 sessions. Self-reinforcement began on session 13, the reinforcers were available at the start/finish point but were not offered. The reinforcers recommended by the participants' teacher were pretzels and potato sticks. Each small stick pretzel was broken into two pieces, one piece was one reinforcer. One potato stick was also one reinforcer.

Phase A: Baseline. Each student completed a baseline phase during which no instruction on goal setting or self-efficacy was given; students self-monitored the distance cycled and edible reinforcers were provided upon the completion of each circuit. Participants self-monitored the distance cycled by placing a marker on the self-monitoring board, located at the start/finish point, upon the completion of each circuit. Self-monitoring and the reinforcement protocol were important elements of the baseline phase as this study was designed to assess the effectiveness of a sequential approach to goal-setting and an increase in self-efficacy. Thus these variables, self-monitoring and reinforcement, were part of the intervention throughout the program. Self-reinforcement was the aim of starting with a reinforcement protocol; the protocol was designed to acquaint the participants with the location of the edibles and the number of edibles which should be taken at one time. Participants were assigned one of three baseline phases; three, five or seven sessions.

During Phase A students began cycling as soon as they were seated securely. The primary researcher stood at the beginning of the circuit near the self-monitoring board. As the students approached the start/finish they took a marker and placed it on the self-monitoring board. If the student did not take the marker or place it on the board independently they were

prompted, verbally and physically if required, by the researcher. After placing the marker on the board an edible reinforcer was provided.

Phase B1: Instruction for intensity goal setting. Participants set intensity goals and self-efficacy was explored, self-monitoring continued during this phase, and reinforcement changed to self-reinforcement on the 13th session. Goal setting instruction began with each participant being asked if they wanted to work hard, go faster that lap or take it a bit easier, which meant to cycle slower during the next circuit. After Lisa, Daniel, or Mark chose an intensity goal the pictogram representing the level was placed on the left side of the student's column on the self-monitoring board. Three circuits per participant were timed each session of Phase B1 and the students were given feedback.

Three times during a session, when a circuit was to be timed, the primary researcher asked each student if they felt convinced they would meet their goal by using the self-efficacy question. The chosen intensity pictogram was placed on the top of the pictures of the two self-efficacy choices and participants were asked how confident they were that they could complete that circuit's goal. Feedback at the end of these circuits included statements such as "You went fast - you knew you could do it!", or "You took it easy and went slower than this (show fast pictogram)". If a student chose the fast goal but in fact went slowly feedback such as "You went the same as this (show slow pictogram), you did not go fast that time". When time to complete a circuit was consistently faster for the high intensity condition, and slower for the low intensity condition, it was reasoned that the participant understood the concept of fast and slow.

Intensity goals, circuit times, number of reinforcers taken, and level of belief of success (self-efficacy) were recorded. When intensity goals corresponded to times completed;

faster times for the high intensity goal, and slower times for the low intensity goal, for three out of four consecutive sessions distance goals were introduced.

Phase B2: Instruction for distance goal setting. During this phase students were given two distance choices, the average number of circuits from the previous two sessions and that number plus one. In addition to the pictogram cards the numbers were verbalized as they were shown to the student. Students chose their goal by pointing to a card. Once the goal was identified the corresponding number of small happy face markers was placed on the left side of the column on the self-monitoring board under that student's name. The students placed a large happy face marker on the right side of the column, directly across from a small marker, as each circuit was completed. This enabled the participants to monitor their progress toward the goal.

Self-efficacy was evaluated during the first 15 minutes of each session. In this phase the number card representing the chosen distance goals was placed in the top part of the self-efficacy questionnaire card. As in Phase B1 participants were asked about their confidence of meeting their goal. Each participant was asked “ (number of goal chosen) circuits, Es-tu capable?” ([Number of goal chosen] circuits, are you capable?). The participant's understanding of the self-efficacy question was difficult to evaluate directly, but it was reasoned that when a participant consistently pointed to “I can” and met the distance goal, or pointed to “can not” and did not meet the goal, that there was some awareness of the concept.

Distance goal set, number of circuits completed, number of edible reinforcers taken, and answers to the self-efficacy questions were recorded. When students set goals accurately, reaching or exceeding their goal, for three out of four consecutive sessions, they began Phase C, maintenance.

Phase C: Maintenance. This phase was the same as Phase B2 but without instruction on goal setting. Participants chose distance goals, self-monitored, and took edible reinforcers on their own. The goal setting cards were prepared in advance and the small happy face markers were placed on the self-monitoring board by the primary researcher. Each participant's self-efficacy was assessed twice a week. Feedback was provided visually through the self-monitoring board.

Photographs. Immediately following each session Mark, Lisa, and Daniel returned to their classroom. On Tuesday and Thursday the primary researcher accompanied the students to the classroom to facilitate the photograph album activity. Photographs taken during the program were placed on a table along with copies of the pictograms used during the program. The newest photographs, usually those taken the previous session were placed directly in front of each participant's album. The photograph albums were placed on the table and opened to a new page. The participants were invited to choose photographs and place them in their book. Teaching assistants were asked to encourage the students to choose and place photographs on the sticky album pages independently.

Data analysis

Distance. Distance data were obtained by recording the number of circuits completed by each student during the sessions. The distance data were visually analyzed. Data patterns within each phase of the study were evaluated by trend and variability (Kennedy, 2005). Variability was identified as high, medium, or low based on dispersion of the data points relative to the best-fit straight line (Kennedy). Data were analyzed by participant (Fig. 3 – 5).

Goal setting. Intensity goals were set during Phase B1. The average time to complete one circuit under both intensity conditions, fast and slow, was calculated across timed circuits for each participant (Fig. 6)

Distance goal setting began in Phase B2. The goals set by the participants were compared to the actual distance completed by observing the self-monitoring board at the end of each session. A photograph was taken of the self-monitoring board immediately after each session, the photographs were dated and filed. The number of circuits participants set as their goal and the number of circuits completed were recorded.

Self-efficacy. The answers, 'I can' and 'I do not think I can' were converted to numerical data, 1 for 'I do not think I can' and 2 for 'I can' to allow the data to be entered onto an Excel worksheet. The results were graphed and visually compared to the goal setting accuracy the participant displayed during a given session. For instance, if a participant indicated that he or she could meet the challenge of their goal this was compared to the number of circuits actually completed.

Photographs. Photograph albums were copied and returned to the students. The third step in the Photovoice technique is to code the photographs and their meanings as generated by the study participants. Patterns or themes were sought by looking for common characteristics of photographs chosen, those not chosen, and pictograms selected for inclusion in the albums. The constant comparative method of analysis was used to develop statements of fact inductively derived from the data (Maykut & Morehouse, 1994). The data were carefully divided into units, or codes of meaning using the constant comparison method which entails placing units that are alike together, and those not alike in other categories, the categories were refined and inclusion rules identified. Relationships and patterns across

categories were explored, and finally the data was transformed into a narrative designed to yield understanding of the people and environments being investigated.

Three categories were initially identified, rules for inclusion in each category were recorded, and the photographs were sorted. A rule for inclusion is a propositional statement that conveys the meaning that is contained in the data which are gathered together under a category name (Maykut & Morehouse, 1994). The first three categories, propositional statement, and rules for inclusions are as follows: (a) action, if people are engaged in a physical activity program they will be active, this was recognized by pictures showing participants in the act of cycling, self-monitoring, or asking for or taking reinforcers; (b) important people, some people prefer to perform physical activity with others while some people prefer to be alone, this was explored by grouping photographs of participants interacting with, looking at, or in close proximity to teachers or teaching assistants during the cycling activity; (c) faces, if a person is enjoying an activity they will have a happy or concentrating face, therefore photographs were sorted by facial expression, positive to neutral affect was identified by faces of participants smiling, concentrating on the task, or showing little affect. Negative affect was shown by faces of participants frowning, crying, or otherwise looking distressed. In addition photographs within each category which were included in the albums and those not chosen were separated.

After reviewing the initial data the categories were refined to three categories and two subcategories. Rules of inclusion were identified and recorded to enhance trustworthiness and reliability. The three categories were similar to those identified originally and included: (a) action, pictures showing participants cycling, self-monitoring, goal-setting, taking reinforcers. This category was broken down into two subcategories of action alone and action with others;

(b) important others, participants interacting with, looking at, or in close proximity to teachers or teaching assistants during the cycling activity, or in any other way soliciting attention of adults involved with the program; (c) faces, positive affect included photographs of participants with a Duchene smile or similar, clapping, thumbs up, or indicated as happy by pictograms in the photograph album. Neutral affect was categorized by photographs with no factors indicating positive or negative affect, and negative affect was shown by grimaces, frowns, or holding one's head in one's hands. At times the participants added pictograms to some album pages; these were used to understand the meaning of the photographs on that page. The type of pictograms, for example the number of happy faces in an album was also of interest.

Further analysis highlighted the common theme of socialization, being with others or alone, in the themes action and important others, consequently these two themes were merged. In addition the photo albums were viewed in their entirety, instead of breaking out each photograph. The dates of each photograph on a single page, the colour of the primary colour in the photograph, and the position of the photographs on the page were noted.

Results

Distance

Lisa and Daniel increased the number of circuits cycled over the course of the program. Lisa completed an average of 4 circuits during baseline, 7.5 during B1 and just over 10 circuits per session during Phase B2 and maintenance (Figure 3). Lisa completed 13 circuits on two occasions, therefore cycling one kilometer in 30 minutes during these sessions. Daniel averaged 2 circuits during baseline, 6 during Phase B1, and had a mean of 9 circuits,

with a maximum of 13, during Phase B2 (Figure 4). He did not reach maintenance because he did not meet the criteria to change to Phase C until the last session.

Mark did not increase the distance cycled per session over the course of the 12 week program (Figure 5). The number of circuits Mark completed each session was quite variable, ranging from one to six and this was not dependent on the phase of the program. Mark did join the group on a regular basis and remained in the gymnasium or outside for the 30 minute session but many times was content to sit on his tricycle and observe his peers.

Goal setting

Intensity goals. Intensity goals were introduced at the beginning of Phase B1. Circuits were timed at least three times every session for each participant. The criterion to move to Phase B2 was 75% accuracy in meeting the goals set for each circuit, completing circuits in less time when the high intensity goal was chosen over the low intensity goal. Lisa met the criteria in 5 sessions, Mark in 8 sessions while Daniel remained in this phase for 11 sessions.

As Figure 6 shows the average time for circuits completed under the low intensity condition was longer than for circuits chosen as high intensity. The difference in the amount of time to complete one circuit under the slow condition and one under the fast condition was 44 s for Lisa, 50 s for Daniel, and 39 s for Mark. This time variation suggests that the participants understood the difference between setting a goal of slow or fast.

Distance goals. As in Phase B1, the criterion to move to Phase C, maintenance, was 75% accuracy in meeting or exceeding one's goal. The goals reflected the number of circuits to be completed during the 30-minute session. Lisa completed seven sessions in this phase, thereby accurately setting a distance goal during three of the final four sessions. Mark was accurate in distance goal setting during the last 4 of 10 sessions he completed in Phase B2.

Daniel met the criterion to move to Phase C during the final four sessions of Phase B2, he exceeded the number of circuits by one on two occasions and met his distance goal on the last session.

Self-efficacy. During Phase B1 time per circuit was compared to the intensity goal chosen and the participants' perceived ability to achieve the goal, or their self-efficacy for that particular circuit. During the five sessions of Phase B1 Lisa indicated that she knew when she was cycling at a slower pace, she regularly pointed to "I can" when she cycled at the appropriate speed for the low intensity level. The high intensity condition was more difficult but by the third session she was accurate for that condition also, cycling faster during the high intensity condition than when low intensity was chosen. Daniel and Mark usually indicated "I can" to all intensity goals during the first half of Phase B1 but this was only accurate for half of the circuits. Mark's accuracy began to increase after four sessions. Daniel's perceived ability to perform at the chosen developed over several weeks. He completed seven sessions before accurately knowing if he would go fast or slow. All three of the participants had more difficulty under the high intensity, or faster, condition.

Self-efficacy was evaluated during Phase B2 but the question was changed to reflect the number of circuits chosen as the goal. At the beginning of this phase Lisa and Mark were apt to chose the answer "I'm not sure" when asked about their perceived ability to meet the distance goal selected for the session. Mark indicated that he was unsure if he was able to meet his goal four out of the first six sessions of this phase, while Lisa was unsure three out of six sessions. During the remaining sessions in Phase B2 and C Lisa always chose 'I can' while Mark chose 'I can' all but once, during session 26, when he chose 'I'm not sure' and actually did not achieve the number of circuits set as his goal.

Daniel completed fewer sessions while setting distance goals than Lisa and Mark. He chose the answer 'I can' six times during the eight sessions of Phase B2. The distance goal he set was not met twice, sessions 25 and 30. During the last four sessions Daniel's accuracy increased when indicating his self-efficacy, though he only met his goal one time during these sessions he exceeded the number of circuits set as his goal by merely one circuit two times. Similarly, the majority of times Lisa was not accurate she had indicated 'I can' but actually exceeded the distance goal by one circuit; it can be argued that the error may have been caused by the limited choice of goals.

Photographs. The photographs which were placed in the photographs albums, as well as the photographs which were not used, were sorted into broad categories by common features which represented three initial patterns: action, significant others, and affect. Rules for inclusion in each category were identified. For example the rule for inclusion under the action category was written as follows: pictures showing people in the act of cycling, self-monitoring, setting goals, asking for or taking reinforcers. The photographs within each theme were then examined and the categories were refined. Relationships between the categories were explored, for instance seeking attention and positive affect appeared to be related for Daniel and Mark, while Lisa preferred to be alone. Acknowledging each participant's preference and the relationship between them led to the theme of social interaction.

The photograph albums were also studied. Maykut and Morehouse (1994) suggest studying the propositional statements for those that stand alone and those that form relationships to help create meaning from the data. The process of studying the photograph albums not only added more meaning to some photographs, but also conveyed some of the

interests of each participant. Some pages included photographs from different dates, yet there was often a common colour theme. Daniel, Mark, and Lisa regularly placed the photographs descending the page, just as the lines you are reading go from the top of the page to the bottom (Fig. 7). The relationship between choosing photographs with and without others, the addition of pictograms, and the organization of photographs on the album pages combined to form the theme called storytelling. Pictograms were placed on 45% of the photograph album pages, all of which were happy faces, with the exception of one tricycle. These findings were integrated with the information gathered from the analysis of the individual photographs. The number of times the participants indicated they were happy by using pictograms coupled with the number of photographs in the positive affect category led to the theme of enjoyment. In all, three themes emerged from the visual data: enjoyment, social interaction, and storytelling.

Discussion

This study demonstrated that attention to the attitudes required to behave in a self-determined manner is beneficial when designing interventions to increase sustained physical activity for individuals with severe ASD. The attitude of self-efficacy was targeted during a cycling program. Strong self-efficacy is important for participation in physical activity (Bandura, 1997) as well as self-determination, therefore it was hoped that as self-efficacy increased participants would be able to effectively engage in the self-determination skills of self-monitoring, goal setting, and self-evaluation while cycling. Three students participated in the cycling program on a regular basis, Lisa and Daniel increased their distance cycled during a 30 minute session. Though the distance Mark cycled did not increase substantially during the program there was an increase over the last seven sessions. For several weeks in the middle of the program Mark was more interested in sitting on his tricycle and watching

everyone cycle around him, he then began actively participating again. It is possible that Mark's knowledge of the activity increased by observing others. Even though Mark did not cycle very much during some sessions he still attended the program and was involved in the photograph album activity. Therefore we do not know the impact the intervention would have had on the distance Mark would have cycled if the program was extended. This supports Todd and Reid's (2007) previous findings that some individuals with ASD require many weeks to feel comfortable and engage fully in physical activities. Future studies should take this into consideration and increase the duration of the physical activity programs. Nonetheless, this intervention was successful in engaging the students in the activity.

Earlier studies have found that individuals with severe disabilities benefit from direct instruction for some self-determination skills such as self-monitoring and choice making (Koegel et al., 2001) but more complicated skills such as goal setting are typically not used (Wehmeyer, 2005). This was observed in an earlier study by Todd and Reid (2004) in which four students with ASD set goals and self-monitored during a walk/jog activity. Goal setting accuracy was low at the beginning of the program, only 17% of goals set were met in a given 30 minute session. Accuracy increased to 53% by the end of the program as participants began to understand the concept of goal setting and realize the distance they were capable of walking or jogging on a given day. At the start of the program their personal capacity of self-efficacy was not at a level which permitted them to predict what they were capable of and set realistic goals, though goal setting became more accurate, possibly through experience, it was only slightly over a 50-50 chance of meeting one's goal. These results suggest that goal setting was not an optimal intervention without building the attitudes and knowledge required to use the skill.

The majority of people can set effective goals by adolescence. One important construct when setting goals is knowing what one can do in a given situation, or in other words, self-efficacy. Self-efficacy is a developmental construct; a new born baby does not have any self-efficacy. Through countless interactions with the environment there is a developmental progression of a sense of personal agency. Very young children begin to perceive causal relations between events, this is followed by the understanding of causation through action, and ultimately to recognizing oneself as the agent of the action (Bandura, 1997). The development of self-efficacy can be promoted or inhibited by the environment. Environments in which caregivers are responsive to communicative behaviour, and are enriched with opportunities for efficacious actions and various mastery experiences promote the development of self-efficacy (Bandura). Typically by 20 months of age many infants have developed the notion of being agents of their actions. The developmental path of self-efficacy is not known for individuals with severe disabilities but appears to be less advanced than their typically developing peers. Introducing the concept of self-efficacy in a progressive fashion with informative feedback was effective in helping the participants develop an understanding of what they could accomplish during the physical activity. At the beginning of the program Mark, Lisa, and Daniel were not accurate in meeting the intensity goals, fast or slow, that they choose for a specific cycling circuit. With specific, informative feedback the students were able to differentiate between cycling fast and cycling slowly, timed circuits were up to 60 s faster when the fast goal was chosen. Goal setting became more accurate as the program continued but at different rates for each participant. Lisa moved through Phase B1 in five sessions, meeting her goal three out of four sessions quickly, in contrast it took Daniel 11 sessions.

It can be hypothesized that as Lisa, Mark, and Daniel became increasingly accurate setting intensity goals they grasped the concept of cycling fast and slow. Piaget (1963) explains that when children encounter a novel situation in the environment they experiment with the results of their actions:

The child repeats the movement which led him to the interesting result, he no longer repeats them just as they are but gradates and varies them, in such a way as to discover fluctuations in the result...(and ultimately this) has the tendency to extend to the conquest of the external environment. (p. 267, parenthesis added).

The child is not only repeating his behaviour but is “grasping with his mind” the new situation and is “searching for the condition essential to a certain result” (Piaget, p. 275). As Lisa, Mark, and Daniel experimented within the new environment they began to understand that an increased rate of pedaling resulted in a faster time, slower pedaling a slower time. As goal setting accuracy became consistent and the students set more difficult goals we believe that the students understood their ability to act on the environment.

Self-efficacy is an important element in sustained participation in physical activity (Bandura, 1997). Implementing instructional strategies which target both physical activity skills and engagement had a positive effect. Supportive feedback was provided through the self-monitoring intervention as well as through social support from the staff members involved in the study. Bandura posits that social support affects exercise adherence by influencing efficacy beliefs. There appears to be a symbiotic relationship between efficacy and engagement in physical activity, as one

increases the other does also. Therefore direct instruction targeting self-efficacy is beneficial for individuals with severe ASD. Until the development of self-efficacy in people with severe disabilities is better understood this attitude should be evaluated and direct instruction provided when required.

This study demonstrated that self-reports of self-efficacy can be obtained from non-verbal students and that the reports are reliable. This was demonstrated by the increase in goal setting accuracy as the participants indicated that they were more comfortable knowing what they were able to accomplish at a given moment. The number of times "I can" was selected and the goal met was higher during the second half of the program. This was demonstrated by Lisa and Mark's average accuracy rate during the maintenance phase, 78%, by Lisa and Mark, which is higher than the average in Phase B of 55%.

Mastery of self-regulation behaviours was demonstrated by the participants ability to set goals, self-monitor, evaluate their result and self-reinforce. As use of these self-determination skills increased Mark, Lisa, and Daniel became more engaged and had more fun during the cycling activity. The photograph albums that the participants created during the program supported this.

The photograph albums enabled Lisa, Daniel, and Mark to document their experience during the cycling activity. This was a new activity for these students and they seemed to enjoy it during the very first session. The students were always eager to see photographs of themselves and others in their class. As the activity became familiar the students began adding pictograms to the photograph albums, this was helpful for others looking at the album in making sense of what the student was saying.

The first theme that was recognized throughout the photograph albums was enjoyment. All of the affect pictograms added to the photograph albums were happy faces! Likewise, the majority of photographs placed in the photograph albums were of the students smiling and looking happy. Some of the photographs, when observed alone seemed to show the student as experiencing neutral or negative affect, but when the photographs were viewed in the albums there was often a happy face close by. We realized that it is difficult to infer how a person is feeling by simply evaluating their facial expression at a given time. Similarly, Todd and Reid (2004) found that evaluation of affect from facial expressions may be particularly difficult during physical activity. The photograph albums confirmed that indeed the participants were experiencing enjoyment during the program. These findings stress the importance of self-reports.

Social interaction figured prominently in the pictures selected for the photograph albums, this was the second theme which was drawn from interpreting the photographs albums. Daniel and Mark included many images showing a teaching assistant they regularly interacted with, and photographs in which there were other students. On the other hand, Lisa, seemed to prefer to cycle alone, she would time her circuits so that she was usually one half of a circuit ahead of Daniel and Mark. She rarely chose photographs with other people in them. Understanding, acknowledging, and respecting these preferences is an important step in designing successful interventions. This program may have been one of the few times in the school day that the students were able to decide with whom and how they wanted to interact.

The third theme which emerged was storytelling. Storytelling is an important form of communication and typically develops early in childhood (Im, Parlakian, & Osborn, 2007; Mello, 2001; Pasupathi & Rich, 2006). The development of storytelling has been traced back to infants in their first year of life and encompasses forms of prelinguistic communication, consequently, language, as in the spoken or written word, is not necessary to share a story (Bruner, 1990; Im et al., 2007). Scaruffi (2006) explained that language is a game in which cooperation is required between the speaker and the listener, and only when the two parties cooperate will language make sense. Thus, stories can be shared through many types of media as long as the parties work together towards a common end. This innovative idea opens many doors to individuals with severe communication problems. The ability to tell social stories, or narratives, is an important part of development and creates of sense of belonging and understanding. Narratives are generally about doing things on the basis of one's beliefs and desires, striving for goals, meeting obstacles which are overcome or occasionally ones which get the better of the narrator (Bruner, 1990). The inherent nature of physical activity suits storytelling, the photograph albums provided a method for Lisa, Daniel, and Mark to tell their stories.

Similar to a storybook the photographs in the albums had a certain organization, the participants placed them in a certain order or with matching colours. Nearly all of the pages were organized in a linear fashion, from top to bottom, and sometimes the photographs were rearranged on the page. At one point Lisa picked up a pictogram of a sad face and placed it in her book, a few seconds later she removed the sad face and added a happy face pictogram to the picture, she seemed cognizant

that the photograph albums conveyed a message. Through creating their own account of the cycling activity Lisa, Daniel, and Mark were able create and share meaning, mastery, and feel part of the larger community.

Children without verbal communication may not have the same ability to participate in storytelling as their peers. It is hypothesized that only when children can follow a story line, systemize and connect what is seen and heard, can he or she store and then recall the information (Masataka, 2003). In addition to aiding memory, sharing one's story has the effect of making the storyteller feel worthy (Im et al., 2007; Pasupathi & Rich, 2006). Though the original intent of the photograph albums was to understand which aspects of the intervention were important in making the activity engaging for these students it appears that the albums may have had a dual role. Im and colleagues (2007) stressed the importance of storytelling to a persons self-esteem, they explained that sharing a story sends an implicit message to the storyteller that they are effective communicators and worthy of being noticed. The album activity became a positive aspect of the program; the participants were eager to see the new images each week and enjoyed looking through their albums, alone and with adults in the classroom. The photograph albums may have become a source of motivation to participate in the activity, as well as making the experience more meaningful and memorable.

This study supports earlier research that suggests when students are able to act in a self-determined manner they become actively engaged in what they are doing. Enjoyment increased during the activity and Daniel, Lisa, and Mark were engaged for 30 minutes.

Physical activity interventions which teach and encourage self-determination behaviors are effective in promoting sustained physical activity.

References

- Abery, B. & Stancliffe, R. (2003). A tripartite ecological theory of self-determination. In M. Wehmeyer, B. Abery, D. Mithaug, & R. Stancliffe (Eds.), *Theory in self-determination foundations for educational practice* (pp. 43-78). Springfield, Ill: Charles C Thomas.
- Abery, B., Rudred, L., Arndt, K., Schauben, L. & Eggebeen, A. (1995). Evaluating a multicomponent program for enhancing the self-determination of youth with disabilities. *Intervention in School and Clinic*, 30, 170-179.
- Agran, M., Blanchard, C., Wehmeyer, M., & Hughes, C. (2002). Increasing the problem-solving skills of students with developmental disabilities participating in general education. *Remedial and Special Education*, 23, 279-288.
- Agran, M. & Wehmeyer, M. (2006). Child self-regulation. In M. Hersen (Ed.), *Clinician's Handbook of Child Behavioral Assessment* (pp.181-199). Boston: Elsevier.
- Alberto, P. & Troutman, A. (2006). *Applied behavior analysis for teachers* (7th ed.). New Jersey: Merrill Prentice Hall.
- Algozzine, B., Browder, D., Karvonen, M., Test, D., & Wood, W. (2001). Effects of interventions to promote self-determination for individuals with disabilities. *Review of Educational Research*, 71, 219-277.
- American Psychiatric Association. (1994). *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV) (4th edition). Washington DC: Author.
- Anton, S., Perri, M., Riley III, J., Kanasky, W., Rodrigue, J., Sears, S., & Martin, A. (2005). Differential predictors in adherence in exercise programs with moderate versus higher

- levels of intensity and frequency. *Journal of Sport and Exercise Psychology*, 27, 171-187.
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.
- Bandura, A. (1997). *Self-efficacy the exercise of control*. New York: Freeman.
- Bandura, A., Caprara, G., Babaranelli, C., Gerbino, M., & Pastorelli, C. (2005). Role of affective self-regulatory efficacy in diverse spheres of psychosocial functioning. *Child Development*, 74, 769-782.
- Berkeley, S. L., Zittel, L. L., Pitney, L. V., & Nichols, S. E. (2001). Locomotor and object control skills of children diagnosed with autism. *Adapted Physical Activity Quarterly*, 18, 405-416.
- Bozian, S., Rejeski, W., & McAuley, E. (1994). Self-efficacy influences feeling states associated with acute exercise. *Journal of Sport and Exercise Psychology*, 16, 326-33.
- Brantlinger, E., Jimenez, R., Klinger, J., Pugach, M., & Richardson, V. (2005). Qualitative studies in special education. *Exceptional Children*, 71, 195-207.
- Bruner, J. (1990). *Acts of meaning*. Cambridge, MA: Harvard University Press.
- Columbus, M., & Mitahug, D. (2003). The effects of self-regulated problem-solving instruction in the self-determination of secondary students with disabilities. In D.Mithaug, D. Mithaug, M. Agran, J. Martin, & M. Wehmeyer (Eds.) *Self-determined learning theory construction, verification, and evaluation*. (pp. 172-187). Hillsdale, NJ: Erlbaum.
- Creswell, J., & Clark, V. (2007). *Designing and Conducting Mixed Methods Research*. Thousand Oaks, CA: Sage.

Denzin, N. & Lincon, Y. (2003). *Strategies of Qualitative Inquiry* (2nd edition). Thousands Oaks, CA: Sage.

Department of Justice Canada (1982). *Canadian Charter of Rights and Freedoms*.

Constitution Act, Part I. Retrieved Oct. 10, 2003, from

http://canada.justice.gc.ca/Loireg/charte/const_en.html

Fallon, E., Hausenblas, H., & Nigg, C. (2005). The transtheoretical model and exercise

adherence: examining construct associations in later stages of change. *Psychology of Sport and Exercise*, 6, 629-641.

Ganz, J. & Sigafoos, J. (2005). Self-monitoring: Are young adults with MR and autism able to

utilize cognitive strategies independently? *Education and Training in Developmental Disabilities*, 40, 24-33.

Greenspan, S. & Wieder, S. (1998). *The Child with Special Needs Encouraging Intellectual and Emotional Growth*. Boston: Addison-Wesley.

Human Resources and Skill Development Canada. (2004) *Advancing the Inclusion of People*

with Disabilities 2004. Retrieved on March 19, 2005 from

<http://www.hrsdc.gc.ca/en/hip/odi/documents/advancingInclusion04/toc.shtml>

Im, J., Parlakian, R., & Osborn, C. (2007). Rocking and Rolling: Supporting Infants,

Toddlers, and Their Families. Stories- Their Powerful Role in Language and Literacy [Electronic version]. *Journal of the National Association for the Education of Young Children*, 62, 52-53.

Janesick, V.J. (2003). The choreography of qualitative research design. In N.K. Denzin &

Y.S. Lincoln (Eds.), *Strategies of qualitative inquiry* (pp. 46-79). Thousand Oaks, CA: Sage.

- Johnson, S., Yechiam, E., Murphy, R., Queller, S., & Stout, J. (2006). Motivational processes and autonomic responsivity in Asperger's disorder: Evidence from the Iowa Gambling Task. *Journal of the International Neuropsychological Society*, 12, 668-676.
- Kennedy, C. (2005). *Single-case designs for educational research*. Boston: Allyn and Bacon.
- Koegel, R., Koegel, L., & McNerney, E. (2001). Pivotal areas in intervention for autism. *Journal of Clinical Child Psychology*, 30, 19- 32.
- Lindsay, W., Michie, A., Baty, F., Smith, A., & Miller, S. (1994). The consistency of reports about feelings and emotions from people with intellectual disability. *Journal of Intellectual Disability Research*, 38, 61-66.
- Locke, E.A., & Latham, G. (1990). *A theory of goal setting and task performance*. Englewood Cliffs, NJ: Prentice Hall
- Locke, E., & Latham, G. (2002). Building a practically useful theory of goal setting and task motivation. *American Psychologist*, 57, 705-717.
- Martin, M., & Anshel, M. H. (1995). Effect of self-monitoring strategies and task complexity on motor performance and affect. *Journal of Sport & Exercise Psychology*, 17, 153-170.
- Masataka, N. (2002). The importance of reading picture books to infants. *ABD*, 32(4), 5-6. Retrieved March 15, 2007, from <http://www.accu.or.jp/appreb/report/abd/32-4/abd3242.html>
- Maykut, P., & Morehouse, R. (1994). *Beginning qualitative research: A philosophical and practical guide*. New York: Falmer Press.
- McAuley, E., & Blissmere, B. (2000). Self-efficacy determinants and consequences of physical activity. *Exercise and Sport Sciences Reviews*, 28, 85-88.

- McAuley, E., Courneya, K.S., & Lettunich, J. (1991). Effects of acute and long-term exercise on self-efficacy responses in sedentary, middle-aged males and females. *The Gerontologist*, 31, 534-542.
- McAuley, E., Shaffer, S.M., & Rudolph, D. (1995). Affective responses to acute exercise in elderly impaired males: The moderating effects of self-efficacy and age. *International Journal of Aging and Human Development*, 41, 13-35.
- McDougall, D. & Brady, M. (1998). Initiating and fading self-management interventions to increase math fluency in general education classes. *Exceptional Children*, 64, 151-166.
- Mello, R. (2001). The power of storytelling: How oral narrative influences children's relationships in classrooms. *International Journal of Education & the Arts*, 2(1), 1-16.
Retrieved March 15, 2007, from <http://ijea.asu.edu/v2n1/>
- Ministere de l'Education de Quebec. (1996). *Guide de la declaration d'effectif scolaire des jeunes en formation generale*. Quebec: Direction de l'adaptation scolaire et des services complementaire.
- Mithaug, D., Mithaug, D., Agran, M., Martin, J., & Wehmeyer, M. (2003). Understanding the engagement problem. In D. Mithaug, D. Mithaug, M. Agran, J. Martin and M. Wehmeyer (Eds.) *Self-determined learning theory* (pp.3-18). Hillsdale, NJ: Erlbaum.
- Moritz, S., Feltz, G., Fahrback, K., & Mack, D. (2000). The relation of self-efficacy measures to sport performance: A meta-analytic review. *Research Quarterly for Exercise and Sport*, 71, 280-294.

- Mottron, L., Mineau, S., Martel, G., Berneir, C., Berthiaume, C., Dawson, M., et al. (2007). Lateral glances toward moving stimuli among young children with autism: early regulation of locally oriented perception? *Development and Psychopathology*, 19, 23-36.
- Ozonoff, S., Strayer, D., McMahon, M., & Filloux, F. (1994). Executive function abilities in autism and Tourette syndrome: An information processing approach. *Journal of Child Psychology and Psychiatry*, 35, 1015 – 1032.
- Pasupathi, M., & Rich, B. (2006). Inattentive listening undermines self-verification in personal storytelling. *Journal of Personality*, 73, 1051-1085.
- Payne, R., & Jahoda, A. (2004). The Glasgow Social Self-Efficacy scale- A new scale for measuring social self-efficacy in people with intellectual disability. *Clinical Psychology and Psychotherapy*, 11, 265-274.
- Piager, J. (1963). *The origin of intelligence in children*. New York: W.W. Norton.
- Prupas, A., & Reid, G. (2001). Effects of exercise frequency on stereotypic behaviors of children with developmental disorders. *Education and Training in Mental Retardation and Developmental Disorders*, 36, 196 – 206.
- Renner, P., Klinger, L., & Klinger, M. (2000). Implicit and explicit memory in autism: is autism an amnesic disorder? *Journal of Autism and Developmental Disorders*, 30, 3 –14.
- Richardson, L. (1994). Writing a method of inquiry. In N.K. Fenizon & Y.S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 516-529). Thousand Oaks, CA: Sage.
- Scaruffi, P. (2006). *The nature of consciousness: The structure of life and the meaning of matter*. Oxfordshire, ENG: Omniware.

- Slemon, J. (1998). Self-efficacy in adults with and without learning disabilities. (Doctoral dissertation, 1998). *Dissertation Abstracts International*, 59, 1910.
- Smith, I. (2000). Motor functioning in Asperger Syndrome. In A. Klin, F.R. Volkmar, & S.S. Sparrow (Eds.) *Asperger Syndrome*, (pp. 97 – 126). New York: Guilford Press.
- Stancliffe, R., & Abery, B.(2003). The ecological model of self-determination: Assessments, curricula, and implications for practice. In M. Wehmeyer, B. Abery, D. Mithaug, and R. Stancliffe (Eds.) *Theory in self-determination foundations for educational practice* (pp221-248). Springfield, Ill: Charles C Thomas.
- Treasure, D. & Newbery, D. (1998). Relationship between self-efficacy, exercise intensity, and feeling states in a sedentary population during and following an acute bout of exercise. *Journal of Sport and Exercise Psychology*, 20, 1-11.
- Todd, T., & Reid, G. (2004). *Does the Picture Tell the Story? Visual Analysis of students with ASD during Physical Activity*. Paper presented at the bi-annual International Symposium for Adapted Physical Activity. Verona, Italy.
- Todd, T., & Reid, G. (2007). *Self-management and engagement of adolescents with ASD during physical activity*. Manuscript submitted for publication.
- U.S. Department of Health and Human Services, 1996. *A report of the Surgeon General: Physical Activity and health*. Springfield, VA: National Technical Information Service.
- Wang, C. & Burris, M. (1997). Photovoice: Concept, methodology, and use for participatory needs assessment. *Health Education & Behavior*, 24, 369-387.
- Wehmeyer, M. L. (1998). Self-determination and individuals with significant disabilities: Examining meanings and misinterpretations. *Journal of the Association for Persons with Severe Handicaps*, 23, 5-16.

- Wehmeyer, M. (2005). Self-determination and individuals with severe disabilities: Re-examining meanings and misinterpretations. *Research & Practice for Persons with Severe Disabilities*, 30, 113-120.
- Wehmeyer, M. & Garner, N. (2003). The impact of personal characteristics of people with intellectual and developmental disability on self-determination and autonomous functioning. *Journal of Applied Research in Intellectual Disabilities*, 16, 255-265.
- Wehmeyer, M., & Metzler, C. (1995). How self-determined are people with mental retardation? The national consumer survey. *Mental Retardation*, 33, 111-119.
- Wehmeyer, M., Yeager, D., Bolding, N., Agran, M., & Hughes, C. (2003). The effects of self-regulation strategies on goal attainment for students with developmental disabilities in general education classrooms. *Journal of Developmental and Physical Disabilities*, 15, 79-91.
- Wilson, P., Rodgers, W., Frader, S., & Murray, T. (2004). Relationships between exercise regulations and motivational consequences in university students. *Research Quarterly for Exercise and Sport*, 75, 81-91.



Figure1: Self-monitoring / Goal setting board

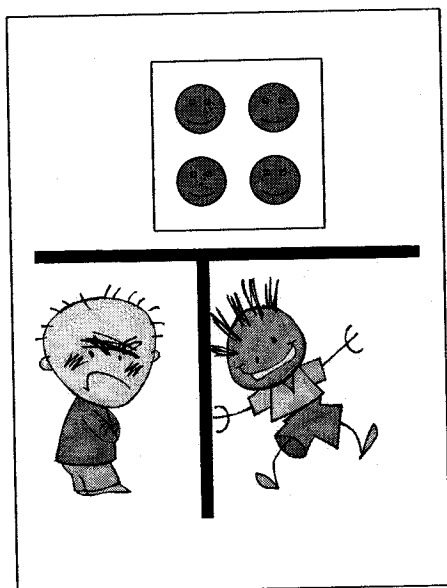


Figure 2 : Self-efficacy questionnaire card

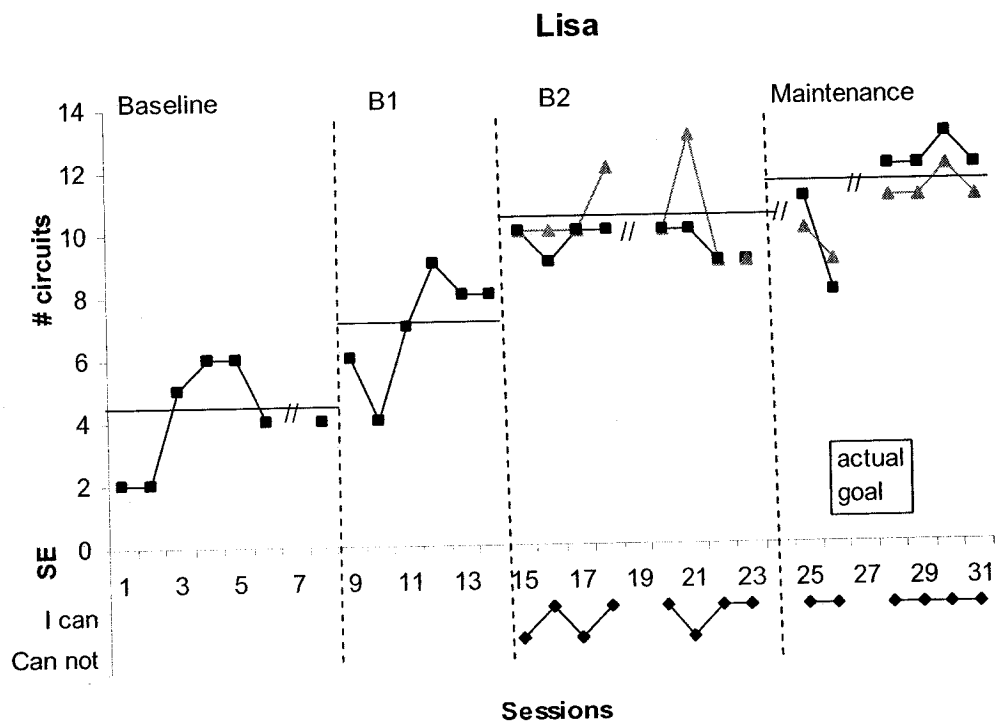


Figure 3: Distance cycled by Lisa over 31 sessions. Goals set during Phase B2 and Maintenance are shown by the pink line, self-efficacy ratings are shown below the X-axis.

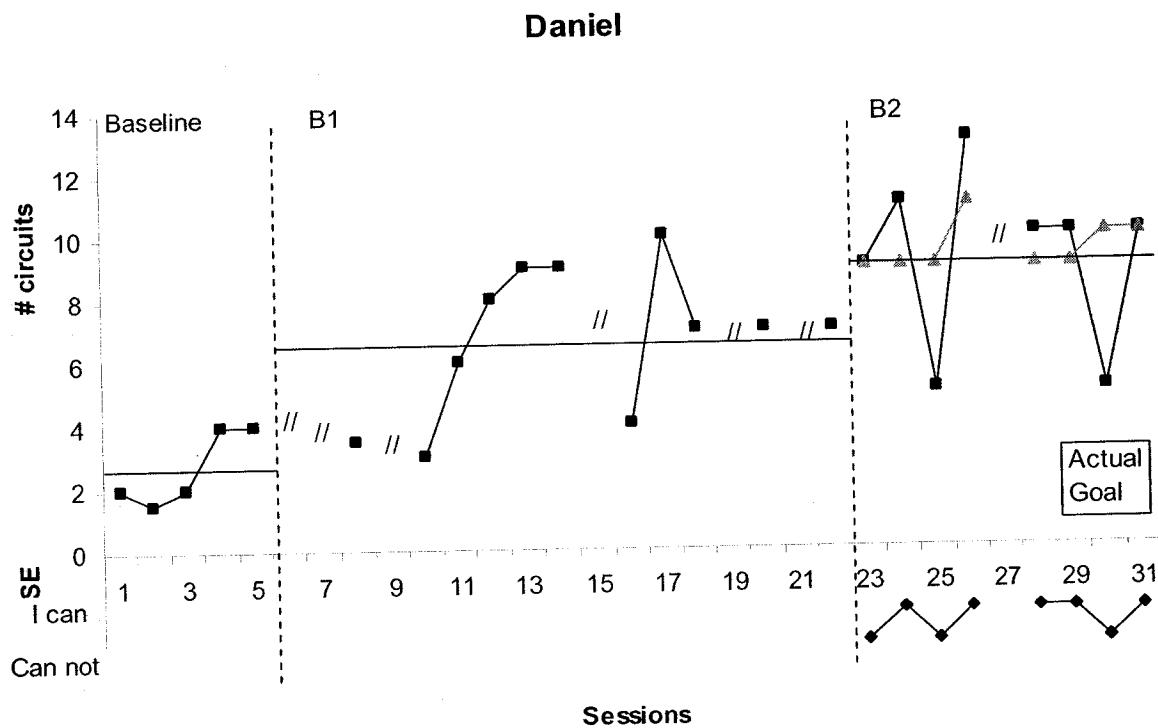


Figure 4: Distance cycled by Daniel over 31 sessions. Goals set during Phase B2 and Maintenance are shown by the orange line, self-efficacy ratings are shown below the X-axis.

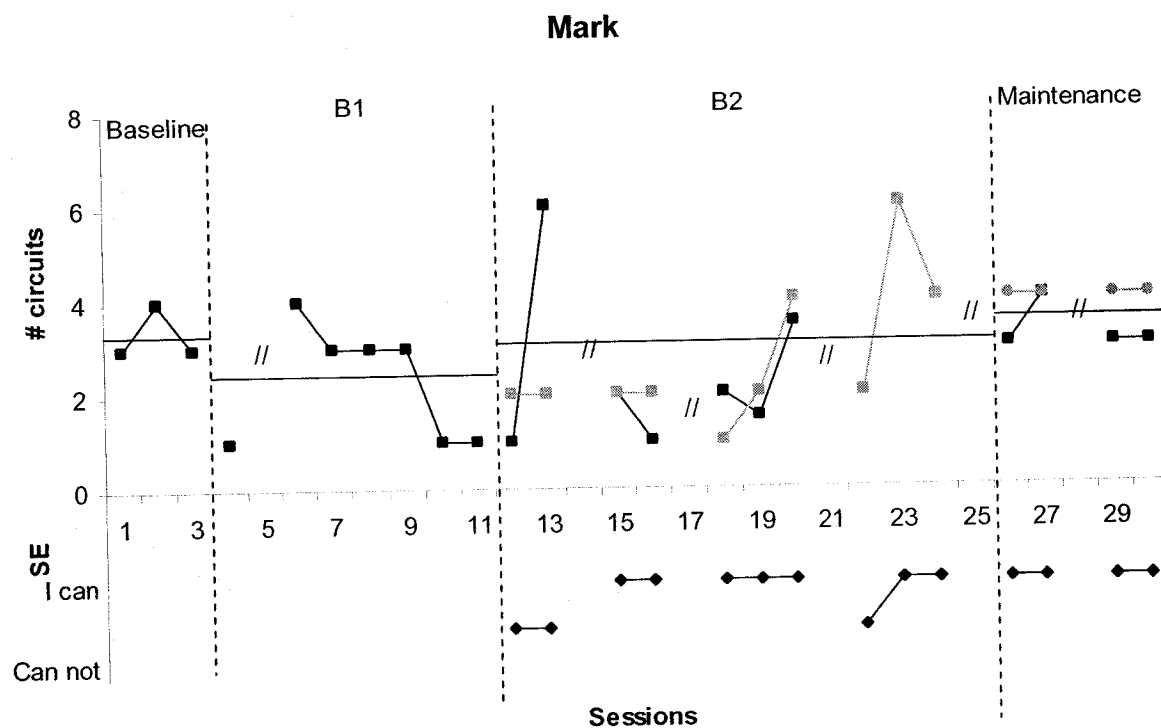


Figure 5: Distance cycled by Mark over 30 sessions. Goals set during Phase B2 and Maintenance are shown by the blue line, self-efficacy ratings are shown below the X-axis.

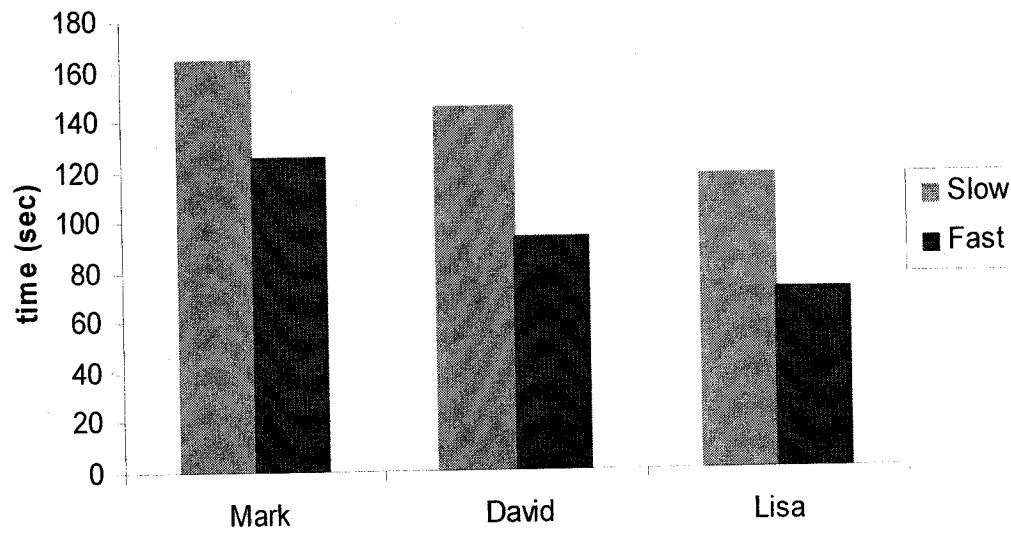


Figure 6 Average time per circuit when slow or fast goal was selected.

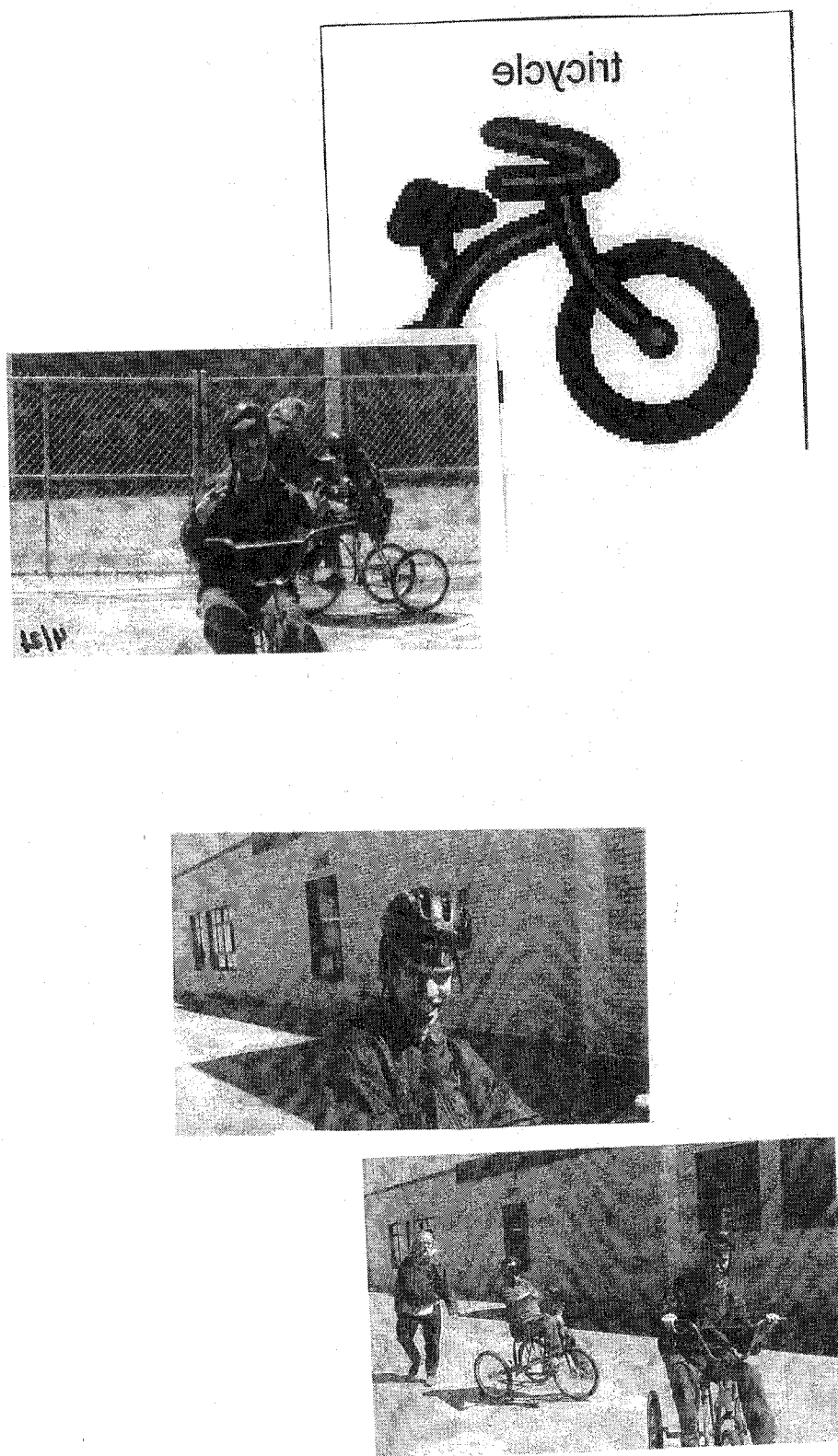


Figure 7. Page from Mark's photograph album.

Chapter 5

Summary

This doctoral dissertation is a series of manuscripts intended to increase our knowledge about interventions designed to engage individuals with severe autism in sustained physical activity. An active lifestyle plays an important role in health, recent guidelines suggest people should partake in 30 minutes of continuous physical activity on most days of the week (U.S. Department of Health and Human Services, 1996). It is estimated that less than 50 % of Canadians meet these guidelines, and this is substantially lower for people with disabilities (Human Resources and Skill Development Canada, 2004). The focus of this dissertation was to engage adolescents with autism spectrum disorder (ASD), on the low functioning end of the spectrum, in 30-minutes of physical activity several times each week. While working toward this goal the research took an unexpected turn, during the first study it became obvious that the voices of the participants were not taken into consideration while designing the intervention, but the participants had knowledge to offer. Qualitative methodologies were added to the research design and the focus of data collection broadened. Duration and amount of physical activity remained important, but understanding how the participants viewed their experience during the activity also became a priority. The experience of the participants during the activity was of equal importance to the amount of activity completed, for if a person enjoys what they are doing and becomes engaged they are more likely to continue participating (Mithaug, Mithaug, Agran, Martin, & Wehmeyer, 2003).

All of the interventions used in the research for this doctoral dissertation were based on self-determination theory. Chapter 1 provided an overview of self-determination theory, moving from early origins to theories in the 21st century. With roots as far back as Plato, it has

long been recognized that acting in a self-determined manner is central to one's quality of life. Modern researchers have transformed the philosophical idea of self-determination into an educational construct which can be broken into teachable components. Quality of life and educational practices are important areas in disability and special education research.

Three studies were completed over a three year period; all the studies were performed in one school with students of similar age and disability. Each study builds on the results of the study before it, trying to improve the instructional strategy. Adaptations were based on the analysis of the amount of physical activity completed, reviewing the use of self-determination skills, and through listening to the participants. By taking the time to hear the participants, which demanded creativity as they all had severe communication difficulties; changes were made to the physical activity program to increase participant engagement.

The first study, chapter two, was based on a snowshoe/walk/jog activity for three young men with autism. An intervention which consisted of self-monitoring, edible and verbal reinforcement was carried out during the activity. Reinforcement decreased during the program while the amount of physical activity the participants completed increased. The research design did not permit the demonstration of functional relations between the variables, therefore it was not clear if self-monitoring, the reinforcers, practice, or a combination was responsible for the increase in physical activity completed during a 30-minute session. The results did show that physical activity increased and participants were able to self-monitor. Toward the end of the program photographs were taken of the participants during the activity. From the photographs it appeared that the participants experienced a change in affect during a 30-minute session. This study contributes to the field of ASD, adapted physical activity, special education, and self-determination. There is a lack of evidence-based studies on

interventions for individuals with severe ASD, this research endeavor debuted a simple method that can be used in many environments to promote physical activity. This manuscript has been published in a peer reviewed journal (Todd & Reid, 2006).

The second study, chapter three, was a mixed methods design which focused on sustained physical activity and the experience of the participants during the activity. The walk/jog physical activity from the first study was repeated but the intervention was changed based on the results of that study. Guided by the Self-Determined Learning Model (Mithaug et al., 2003) which states that goal-setting is one of the first skills used when acting in a self-determined manner, goal-setting was added to the intervention strategy. Therefore participants set goals and self-monitored during a walk/jog program. A repeated measures design was chosen to better understand the relationship of self-determination skills and physical activity. Photographs were taken of the participants during the walk/jog sessions. Two visual methodologies were adapted for use with individuals with severe communication problems, and were implemented with the goal of understanding the participants' affective experience. The results of this study were mixed, the participants did not increase the distance walked/jogged during 30-minutes over the course of the program, but the results from the visual methodologies provided an insight to what parts of the program the participants found engaging. The participants indicated how they felt during the program, this was compared to their teachers' perception, and surprisingly they were somewhat different. Combining the two views, quantitative and qualitative helped the researchers understand which variables of the intervention were effective, what elements of the program the participants enjoyed, and what needed to change. The use of visual methodologies with people who have severe communication challenges is unique and original, this also made analyses more challenging,

but the ability to empower this group made the effort rewarding. This manuscript is presently in the peer review process.

The third study, chapter four, was also a mixed method design combining quantitative, amount of physical activity, and qualitative data from a visual methodology. The Tripartite Ecological Self-Determination theory, in addition to the results from the previous study, guided this study. Focus was placed on three skills, goal-setting, self-monitoring, and self-reinforcement, and one attitude, self-efficacy, which are necessary to be self-determining. The intervention was modified to increase the amount of instruction provided, plus ensure each participant was able to perform the skills at a certain level of proficiency before attempting a more difficult skill. Instead of walking and jogging the participants cycled during this study. This was done by using a changing criteria design. Self-efficacy was assessed during the program, a pictorial questionnaire with possible answers was used to encourage self-reports by the participants. The level of self-efficacy was compared to goal-setting accuracy and amount of physical activity performed. This initiative was unique as the majority of self-efficacy studies involve participants who can speak or write; accessing self-reports from individuals with ASD and severe communication problems is rare. Self-efficacy is an important variable in understanding engagement (Bandura, 1997), but there is an absence of information on this concept for people with severe disabilities. This study demonstrated that the participants did develop a sense of self-efficacy through interactions with a supportive environment. Two participants were able to set goals, self-monitor, and self-reinforce while increasing the distance cycled during 30 minutes. Though the change in physical activity may have affected the motivation to participate in the activity the act of goal

setting was comparable between the studies; both activities were individual and distance was calculated by counting circuits.

Photographs were taken during the physical activity and each participant used these pictures to create a photograph album. The albums told stories of enjoyment and social interaction. Storytelling begins very early in life for typically developing children and is a major source of memory development and socialization, and when told to a receptive audience nurtures a sense of self (Masataka, 2002; Mello, 2001). The simple act of being able to share their stories may have been motivation to attend the physical activity program, future research should investigate methods to which encourage participants to express their experience. This unique and original research endeavor adds to the existing literature in adapted physical activity and special education, as visual methodologies are rarely combined with empirical evidence of education interventions. Hearing the participants is not only important in developing effective teaching strategies (Friere, 1972), but can be motivational as well.

This fifth chapter attempted to lead the reader through the development of an educational intervention designed to promote sustained physical activity for individuals with ASD, and teach self-determination skills. This research generated findings which can guide program development and provided empirical evidence that people with severe ASD are able to learn and use self-determination skills in supportive environments. This has practical applications to the field of adapted physical activity. The self-monitoring intervention designed was easy to create and can be used with different types of activities. All of the participants were able to self-monitor, this in itself may prove motivational. Self-monitoring is an underutilized strategy (King-Sears, 1999), but important to becoming self-determined.

Koegel and colleagues refer to self-monitoring as a pivotal behaviour (Koegel, Koegel, & Carter, 1999; Koegel, Openden, Fredeen, & Koegel, 2006). Pivotal behaviors are central to a wide area of functioning; therefore a change in the ability to self-monitor can produce improvement across a number of behaviours (Koegel et al., 2006). This is a skill which can be added to many existing interventions. Future research should track generalization of self-monitoring taught during physical activity.

Goal-setting can be taught to individuals with severe ASD. Though it seemed more difficult to learn than self-monitoring, participants in the third study were able to set realistic goals by the end of the program. Self-determination skills for people with severe disabilities have mainly focused on choice and self-monitoring, it is time to focus on some of the more complex skills. The effort involved in teaching goal-setting is quite high and presently it is not known if this skill will transfer to other settings and environments. Careful evaluation should be carried out to ascertain if goal setting is beneficial beyond self-monitoring. Distance walked and jogged increased during Study one, when self-monitoring and edible reinforcers were part of the program, and also in Study three, when participants self-monitored, set goals, and had the ability to take edibles as reinforcement when desired. The role of goal-setting should be explored and compared to the time and effort required to teach the skill to determine the true efficacy of the intervention.

More study is needed in the area of self-efficacy. Study three was a first attempt to measure self-efficacy of individuals with severe ASD during physical activity. The role of self-efficacy on participation, motivation, and effort for persons with severe disabilities is just beginning to be explored. Future research is required to validate measurement instruments

with this population and to more fully understand the development and role of self-efficacy, specifically during physical activity.

This research also generated methodological implications. Adaptation of visual methodologies enabled the participants in studies two and three to share their voice, possibly for the first time, and be heard by the professionals who tell them what, when, and how to perform daily activities. Occasionally the results of the studies were not welcomed by the teachers, especially when the disparity of affect ratings was pointed out. The teachers had been convinced that without a doubt they 'knew' their students and could tell how they felt through observation. It is time to listen to the students and empower them to take as much personal control as they are able, and desire to, in educational settings. Future research studies with persons with ASD should focus on involving the participants in the process. Recently the voice of people with disabilities who have communication skills has been heard, it is time to look for creative methods to hear the voice of those who have difficulty communicating.

There were some surprisingly consistent results found from the photographs taken during the three studies. Though visual methodologies were formally part of studies two and three some photographs were taken at the end of study one, these actually led to the idea of using photography during the activity. When viewed across sessions, from the first five minutes, around mid-way, and then at the end of the 30-minutes, often it took more than five minutes for participants to look relaxed and happy. At the beginning of each session some participants looked anxious, even after four months of attending the program. A take home message from this is to allow sufficient time for individuals to feel comfortable. Another interesting finding was that teachers and teaching assistants are not always accurate when interpreting facial expressions of the participants during physical activity. The photograph

albums included photographs in which the participant was not smiling, on initial glance at the picture it would seem that the person was not too happy, but many times a happy face would be placed beside the photograph. Inferring how a person feels by facial expression may not be accurate.

On a global scale we can argue that increasing personal control through self-determined behaviors and increasing physical activity will have positive implications to the participants' quality of life. Research is required on the generalizability of self-determination skills taught during a physical activity program. Are the skills used in other areas? If not, how can we facilitate this transfer? And we must keep moving forward in our quest to foster active lifestyles. Interventions which are simple to use, effective, and empower the participant are important. If the interventions are simple then they are more likely to be used, user-friendly merchandise is critical. Empirical evidence supports the claim that this intervention is beneficial. Empowering the participants will create, within them, the desire to engage in the activity, and that alone may be the best deterrent of continued participation.

In summary, this doctoral dissertation was an attempt to create a physical activity program which would engage individuals with ASD in sustained physical activity. Through this process a better understanding of engagement developed, creative methods to allow participants to share their voices were used, and individuals with ASD regularly performed 30-minutes of physical activity.

References

- Bandura, A. (1997). *Self-Efficacy: The exercise of control*. New York: W.H. Freeman & Co.
- Freire, P. (1972.) *Cultural action for freedom*. New York: Penguin.
- Human Resources and Skill Development Canada. (2004) *Advancing the inclusion of people with disabilities* 2004. Retrieved on March 19, 2005 from
<http://www.hrsdc.gc.ca/en/hip/odi/documents/advancingInclusion04/toc.shtml>
- King-Sears, M. (1999). Teacher and researcher co-design self-management content for an inclusive setting: Research training, intervention, and generalization effects on student performance. *Education and Training in Mental Retardation and Developmental Disabilities*, 34, 134-156.
- Koegel, R., Koegel, L., & Carter, C. (1999). Pivotal teaching interactions for children with autism. *School Psychology Review*, 29, 569-594.
- Koegel, R., Openden, D., Fredeen, R., & Koegel, K. (2006). The basics of pivotal response treatment. In R. Koegel & L. Koegel (Eds.), *Pivotal response treatments for autism: Communication, social, & academic development* (pp. 3-30). Baltimore: Paul H. Brookes.
- Masataka, N. (2002). The importance of reading picture books to infants. *ABD*, 32(4), 5-6. Retrieved March 15, 2007, from <http://www.accu.or.jp/appreb/report/abd/32-4/abd3242.html>
- Mello, R. (2001). The power of storytelling: How oral narrative influences children's relationships in classrooms. *International Journal of Education & the Arts*, 2(1), 1-16. Retrieved March 15, 2007, from <http://ijea.asu.edu/v2n1/>

- Mithaug, D., Mithaug, D., Agran, M., Martin, J., & Wehmeyer, M. (2003). Understanding the engagement problem. In D. Mithaug, D. Mithaug, M. Agran, J. Martin and M. Wehmeyer (Eds.), *Self-determined learning theory* (pp.3-18). Hillsdale, NJ: Lawrence Erlbaum Assoc.
- Todd, T. & Reid, G. (2006). Increasing physical activity in individuals with autism. *Focus on Autism and Other Developmental Disabilities*, 21, 167-176.
- U.S. Department of Health and Human Services (1996). *A report of the Surgeon General: Physical activity and health*. Springfield, VA: National Technical Information Service.

I have read the description of the research project and hereby agree that my son/daughter may participate. I am aware that the results will be used for research purposes only, that the identity of my child will remain confidential, and that the participants can withdraw at any time.

Name of son/daughter _____

Signature of Parent/Guardian

Date