

The Determinants of Successful Cycling in Children with Special Needs

by

Alisha Witter  
B.Kin., McMaster University, 2011

A Thesis Submitted in Partial Fulfillment  
of the Requirements for the Degree of

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**Supervisory Committee**

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**Supervisor**

Dr. Patti-Jean Naylor, PhD (School of Exercise Science, Physical & Health Education)  
**Departmental Member**

## Abstract

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### Departmental Member

Bicycle riding plays a central role in the social and physical lives of most children, however, many children with special needs do not acquire the skills to successfully ride a two-wheeled bicycle. This study explored barriers and facilitating factors associated with learning to ride a two-wheeled bicycle. Participants were children ( $n = 25$ ; and their parents) enrolled in an adapted bike riding camp. The camp was organized by therapists from the Queen Alexandra Centre for Children's Health (QACCH) and facilitated by Lose the Training Wheels staff. The program involved changing the dynamics of the bicycle and the demands of the environment to help children with special needs learn to ride a conventional two-wheeled bicycle. Riding progression, self-efficacy toward cycling, and perceptions of physical competence were assessed pre-camp, immediately post-camp and at a 3-6 month follow-up post-camp. Semi-structured interviews were also conducted with parents at follow-up. None of the children were riding independently at pre-test; however, 96% were riding independently in a controlled environment post-camp. Paired t-test revealed self-efficacy toward bike riding increased significantly from pre- to post-camp ( $M_{pre} = 16.3$ ,  $SD=5.6$ ;  $M_{post} = 21.7$ ,  $SD=4.9$ ,  $p = .001$ ), but perceptions of competence did not ( $M_{pre} = 22.9$ ,  $SD = 4.5$ ;  $M_{post} = 23.5$ ,  $SD = 4.7$ ,  $p = .503$ ). Semi-structured interviews with 10 parents at follow-up revealed that transfer to home was problematic. Five children were no longer riding and four required adult supervision in controlled environments. Common barriers included inaccessible environments, parents unable to help their children, and the re-emergence of children's fear and hesitation. Changes in pre to post-camp skill and self-efficacy were not accompanied by an increase in perceptions of competence, likely due the very high pre-test scores (ceiling effect). At follow-up, most children were not riding in their home environment. Parents were pleased with the camp program overall, but felt that an extension of the program and supports for the transition to home were needed.

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### **Dedication**

This thesis is dedicated to my loving family, whose unconditional support and encouragement led me to achievement my goals and dreams. Thank you for your unwavering guidance and dedication, and for teaching me the greatest glory is not in never falling but in rising every time I fall.

My research is dedicated to all populations living with special needs. May the findings of this research be used to increase participation in physical activity and enhance the quality of life of these individuals. I was particularly inspired by brother, Derek Witter, who has graciously demonstrated strength and courage in the face of adversity after suffering a prenatal stroke. May you continue to inspire others and go confidently in the direction of your dreams.

## CHAPTER 1

### **Introduction**

Physical activity is any bodily movement that results in energy expenditure (WHO, 2013a). Studies demonstrate that regular physical activity can reduce the probability of multiple physical, emotional, and psychological health related conditions (Durstine et al., 2000; Hohepa, Schofield, & Kolt, 2004; Van Der Horst, Paw, Twisk, & Mechelen, 2007). Conversely, the least physically active are at the greatest risk for a variety of chronic diseases, loss of function, and all-cause mortality (Haskell, Blair, & Hill, 2009). As physical activity habits developed in early life may persist into adulthood (Van Der Horst et al., 2007), there are important implications for developing positive associations with physical activity among children. Despite the substantive evidence on the benefits of physical activity, activity levels remain critically low among children and youth (Colley et al., 2011). While data on physical activity behaviours, patterns, and determinants among children with disabilities are limited (Frey, Stanish, & Temple, 2008), there is evidence that this population is even less active (Frey et al., 2008; Longmuir & Bar-Or, 2000; Majnemer et al., 2008; Rimmer & Rowland, 2008; Steele et al., 1996), as opportunities for physical activity and sports participation are often limited (Froehlich-Grobe & Lollar, 2011) and they experience many barriers to participation (Rimmer & Rowland, 2008). Two prominent barriers are low levels of self-efficacy and low perceptions of physical competence. Since self-efficacy and perceptions of physical competence are integral to adoption and maintenance of physical activity, it is of concern that children with disabilities have been shown to have lower levels of each (Valos, Fasha, Umstattd, Zullig, & Paxton, 2008; Sollerhed, Apitzsch, Råstam, & Ejlertsson, 2008). Understanding how to engage children with disabilities in physical activity is urgent as individuals with disabilities are more likely to experience a loss of independence as well as secondary negative health outcomes associated with inactivity (Rimmer, 2005).

Bicycle riding offers a popular source of physical activity and plays a central role in childhood development both physically and socially (Klein, McHugh, Harrington, Davis, & Lieberman, 2005). While many alternatives for physical activity exist, the bicycle is an accessible, relatively inexpensive individual activity; “bicycling is a lifetime sport” (Klein et al., 2005, p. 51). Though riding a bicycle is taken for granted as a societal norm (Klein et al., 2005), many children with disabilities do not acquire the skills to ride a two-wheeled bicycle (Klein et al., 2005). Children with disabilities may benefit from cycling interventions, as they impact mobility, activity, and participation by addressing the impairments they experience (Johnston, 2007). Cycling interventions also provide opportunities for socialization (MacDonald, Jaszewski, Esposito, & Ulrich, 2011). An adapted bicycle riding program entitled Lose the Training Wheels (LTTW), has shown end of camp success (Temple, Bates, Misovic, DeBoer, & Purves, 2011); most children are able to ride a two-wheeled bicycle and want to continue riding at the conclusion of the program (Lose the Training Wheels, 2011).

A useful framework for examining the participation of children with special needs in bicycle riding is the International Classification of Functioning, Disability and Health: Children and Youth (ICF-CY) (WHO, 2007). The model can facilitate descriptions of the associations between outcomes of the LTTW program (participation) and the children’s body functions and structures, activities, and personal or environmental factors (Temple et al., 2011). The ICF-CY is a classification of health and health-related states (WHO, 2002) and “offers a conceptual framework for understanding functioning and disability” in children and youth (McDougall, Wright, & Rosenbaum, 2010, p. 204). This model is used to understand how body functions and structures, activity, and participation interact with each other and how they are influenced by environmental and personal conditions (WHO, 2007). This study expands on previous work by

investigating how children's bike riding progresses over the course of the five day camp, and the impact that the children's cycling skills have on their self-efficacy toward riding a two-wheeled bicycle and their perceptions of physical competence. Further, this study examines the extent to which skills learned at camp transfer to home and explores the barriers and facilitating factors for riding after camp using the ICF-CY (WHO, 2007) as an organizing framework. The intent is to provide insight into how the development of the child's skills at camp interacted with their home context. In closing, understanding participation in bicycle riding as a life task may facilitate participation in physical activity among children with disabilities.

### **Aim**

The aim of this study is to examine if and how participation in bicycling among children with special needs changed as a result of participating in the Lose the Training Wheels (LTTW) bicycle-riding program. A second aim of this study was to determine whether this program transferred well to the home environment and what factors facilitated or created barriers to cycling.

### **Research Questions**

1. What are the changes in the activity of cycling (progression), self-efficacy toward cycling, and perceptions of physical competence from pre to post LTTW camp?
2. How does participation in cycling change from pre-camp to post-camp to follow-up?
3. In what ways were self-efficacy, perceptions of physical competence, the ability to cycle (activity), and the children's social and physical environment related to participation?

### **Delimitations**

The study is delimited to children with special needs and their parent(s) who are receiving services from the Queen Alexandra Centre for Children's Health. The study is further

delimited to participants recruited from the LTTW program conducted in Victoria BC from July 9-13, 2012.

### **Limitations**

1. The participants were a sample of convenience. The participants were limited to children with special needs enrolled in LTTW; it is difficult to ensure that this sample is an accurate representation of the larger population of children with special needs.
2. Children with a cognitive impairment may have been limited in their ability to accurately respond to survey questions.

### **Assumptions**

1. Participants responded to survey and interview questions honestly and accurately.
2. Children who attended LTTW wanted to ride a bicycle, thus some level of motivation for riding was present.

### **Operational Definitions**

*Activity*: “the execution of a task or action by an individual” (WHO, 2007, p. 229). In the current study, activity is characterized by cycling progression as measured through a spotter survey on progression (WHO, 2007).

*Body Functions*: “the physiological, anatomical, and psychological functions of the body” (WHO, 2007, p. 228).

*Body Structures*: “the structural or anatomical part of the body such as organs, limbs, and their components classified according to body systems” (WHO, 2007, p. 228). In the current study, body functions and structures are characterized by the child’s condition.

*Disability*: the World Health Organization defines disability as, “an umbrella term for impairments, activity limitations, and participation restrictions. It denotes the negative aspects of

the interaction between an individual, and that individual's contextual factors (environmental and personal factors)" (WHO, 2007, p. 228).

*Environmental factors:* "all aspects of the external or extrinsic world that form the context of an individual's life and, as such, have an impact on that person's functioning. Environmental factors include the physical world and its features, the human-made physical world, other people in different relationships and roles, attitudes, values, social systems and services, and policies, rules and laws" (WHO, 2007, p. 229). In the current study, environmental factors are characterized by parental descriptions of these features as they pertain to their child's cycling.

*Follow-up:* three to six months following the conclusion of LTTW.

*Functioning:* "an umbrella term for body functions, structures, activities and participation. It denotes the positive interaction between an individual (with a health condition) and that individual's contextual factors (environmental and personal factors)" (WHO, 2007, p. 228).

*Independent Riding:* defined by the ability to self-start, ride 30 meters without assistance, and self-stop in a controlled environment.

*Launch Day:* defined by the day in which a child has progressed to riding a two-wheeled bicycle of any type.

*Participation:* "a person's involvement in life tasks" (WHO, 2007, p. 229). In the current study, participation is characterized by parental descriptions of cycling involvement (WHO, 2007).

*Personal factors:* "the particular background of an individual's life and living, and comprise features of the individual that are not part of the health condition or health states. These

factors may include gender, race, age, other health conditions, fitness, lifestyle, habits, upbringing, coping styles, social background, education, profession, past and current experience, overall behaviour pattern and character style, individual psychological assets and other characteristics, all or any of which may play a role in disability at any level” (WHO, 2007, p.15-16) In the current study, personal factors are measured by the Self-Perception Profile for Children (SPPC) (Harter, 1985a) and a questionnaire with a focus on the perceived self-efficacy to bicycle (Bandura, 1997).

*Perceptions of physical competence:* “perceived physical competence is defined as one's overall perceptions of personal physical abilities” (Bell, 1997, p. 3). The domain of physical competence is comprised of perceived athletic competence and physical appearance (Harter, 1985a). The current study focuses solely on perceptions of athletic competence to characterize and comprise this domain, thus, perceptions of physical competence include and refer to perceptions of athletic competence as well.

*Pre-camp:* any time prior to the commencement of the LTTW camp.

*Post-camp:* the conclusion of LTTW, directly after the completion of the final cycling session.

## CHAPTER 2

### Literature Review

#### **Physical Activity among Children**

Participation in voluntary recreation such as play and sport is considered to be a critical part of children's growth and development (King et al., 2003). The physical activity afforded by participation in such activities has important health benefits in children, namely, it has been associated with lower blood pressure (Van Der Horst et al., 2007), favourable body composition and glucose metabolism (Hohepa et al., 2004), the maintenance and enhancement of bone density (Durstine et al., 2000), and normal growth and development (Bar-Or, 1983). It has been consistently associated with the promotion of psychological well-being (Durstine et al., 2000) including higher levels of self-esteem, lower levels of anxiety and stress (Van Der Horst, et al., 2007), improved self-image, sleep quality, and stress management, as well as increased self-efficacy (Durstine et al., 2000). Participation in physical activity has also been shown to promote and improve social and emotional well-being (Murphy & Carbone, 2008).

Despite the substantial health benefits of physical activity, only 9% of boys and 4% of girls meet the Canadian Physical Activity Guidelines of 60-minutes of moderate-to-vigorous physical activity on at least six days of the week (Colley et al., 2011). With an alarmingly low prevalence of physical activity among children and a myriad of literature indicating detrimental health complications throughout the lifespan as a result of inactivity (Haskell et al., 2009), physical inactivity among children is justifiably a public health priority (WHO, 2013b).

#### **Physical Activity among Children with Disabilities**

Children with disabilities derive similar benefits from physical activity as their typically developing peers. Higher levels of physical activity among children with disabilities can also reverse deconditioning from impaired mobility, optimize physical functioning, and enhance

overall well-being (Durstine et al., 2000). Furthermore, regular physical activity contributes to the maintenance of normal muscle strength and endurance, joint structure and function, flexibility, and cardiovascular endurance, and is effective in the management of numerous chronic diseases and disabilities (Durstine et al., 2000). These benefits are of great importance as sufficient levels of muscular strength and endurance are associated with increased bone mass, a reduction in injury from falls, and a greater ability to complete activities of daily living (Rimmer, 2001; Chad, Bailey, McKay, Zello, & Snyder, 1999). Several studies have reported a reduction in stereotypic movements such as intense staring, repetitive vocalizations, and rocking back and forth, as well as maladaptive behaviours in children with autism and other developmental disabilities as a result of participation in mildly strenuous exercise (Gabler-Halle, Halle, & Chung, 1993). Reductions in fatigue have also been reported as a result of participation in moderate exercise (Fragala-Pinkham, Haley, Rabin, & Kharasch, 2005). In addition to the physiological and psychological benefits, participation in regular physical activity can foster independence, coping abilities, competitiveness, and teamwork among children with disabilities (Patel & Greydanus, 2002).

Strong international evidence suggests that children with disabilities are less active than children with typical development (Frey et al., 2008; Longmuir & Bar-Or, 2000; Majnemer et al., 2008; Rimmer & Rowland, 2008; Steele et al., 1996). A national study conducted in Canada compared the compromising health risk behaviours of 101 adolescents with physical disabilities to 7020 adolescents without disabilities (Steele et al., 1996). Youth with disabilities had higher rates of physical inactivity compared to typically developing youth across multiple activities (i.e. bicycling, swimming, jogging, etc.). Longmuir and Bar-Or (2000) also show that activity

declines with age for participants with physical disabilities or chronic medical conditions. This finding suggests that levels of physical activity participation are going to decrease further.

The general patterns of low physical activity among children with disabilities are supported by studies focusing on specific conditions. Several studies indicate that children and youth with intellectual disabilities (ID) are less active than their typically developing peers or siblings (Foley, 2006; Sharav & Bowman, 1992; van Mil et al., 2000). A study by Foley (2006) examined the activity levels of nine students with mild ID and a comparison group (classmates) of 37 youth, aged 7–12 years, without a physical or cognitive disability. Physical activity was measured for seven consecutive days using accelerometry and was reported during recess, physical education, after school, and on the weekend. Foley found that participants without ID were significantly more active than youth with ID in all settings; specifically, children without ID were 53% more active during recess, 133% more active during physical education, 52% more active after school, and 33% more active on the weekend than children with ID. An additional study by Sharav and Bowman (1992) compared the physical activity levels of thirty sibling pairs, each with a child with Down syndrome between the ages of 2 and 14. Parent reports of home physical activity demonstrated that youth with Down syndrome were less active than siblings as they spent more time indoors which predisposed them to inactivity (Sharav & Bowman, 1992).

The disparity in physical activity continues in the school environment where low levels of physical activity have been reported in physical education (PE) classes. A study by Sit, McManus, McKenzie, and Lian (2007) examined physical activity levels of 172 children with a physical disability, mild intellectual disability, hearing impairment, or visual impairment enrolled in grades 4 to 6 in five special education schools in Hong Kong. The System for Observing Fitness Instruction Time (SOFIT) was used to code the physical activity of children

during both physical education and recess and to document teacher behaviour and lesson context in physical education. During school hours, children with disabilities received only 14.6% of the recommended physical activity minutes (Sit et al., 2007). An additional study by Kochersperger (2005) compared 36 youths with a disability (55% intellectual disability, 17% Autism, 5.5% learning disability, 11% health impaired, 11% speech/language, and 11% unspecified disability) to gender and grade matched peers (ages 5–18 years) and found that students with a disability were significantly less active in physical education than students without a disability.

“Sport is a subset of physical activity which involves structured competitive situations governed by rules” (Fox & Riddoch, 2000, p. 498). A study by Steel et al. (1996) indicates that youth aged 11-16 years are more likely to seldom or never play in a sports league or on a sports team compared to youth without disabilities (Steele et al., 1996). This low level of sports participation is problematic as participation in such events can improve the psychological well-being of children with disabilities by providing opportunities to form friendships, express creativity, develop a self-identity, and foster meaning and purpose in life (Dykens, Rosner, & Butterbaugh, 1998). Weiss, Diamond, Demark, and Lovald (2003) report that Special Olympics participants between 9-43 years of age show improved self-esteem, perceived physical competence, and social acceptance. Parents of Special Olympians report that their child’s participation promoted social adjustment and life satisfaction (Klein, Gilman, & Zigler, 1993).

The Council on Sports Medicine and Fitness and Council on School Health (2006) has suggested that the inaccessibility of physical activity, particularly for children with disabilities, has perpetuated participation in sedentary activities. Rimmer (2007) reports that the proportion of students who engaged in sedentary activities (i.e. video/computer game) 3+ hours/school day was significantly higher for students with physical disabilities (26.6%) compared to those

without disabilities (20.4%). Furthermore, Steele et al. (1996) reported that 39% of youth with physical disabilities indicated that they never exercised compared with only 6% of the national Canadian sample. In fact, television viewing was the only activity in which youth with physical disabilities participated in significantly more often: 39% of the youth in this sample watched television more than 4 hours a day compared with only 13% of the national sample (Steele et al., 1996). Generally, Steele et al. found that youth with physical disabilities take part in activities that provide opportunities for exercise, self-improvement, and socialization significantly less often than typically developing youth. Similarly, Majnemer et al. (2008) demonstrated that school-aged children with cerebral palsy are involved in a wide variety of leisure activities; however, involvement in skill-based and active physical activities is low. This pattern of leisure participation is documented in children with a wide range of physical disabilities (Law et al., 2006). This is of concern as participation in physical activities is associated with positive outcomes, such as increased happiness (Huang & Humphreys, 2010) and greater achievement among youth (Larson, 2000). Understanding how to engage children with disabilities in physical activity is urgent as individuals with disabilities are more likely to experience a loss of independence as well as secondary negative health outcomes associated with inactivity (Rimmer, 2005).

### **Opportunities for Participation among Children with Disabilities**

Affording opportunities to children with disabilities to fully utilize their motor abilities is of importance as “success in physical activity fosters intrinsic motivation for involvement in more activity” (Klein et al., 2005, p. 51). Despite the cyclic nature of physical activity participation, research suggests that children with disabilities are less active than typically developing peers primarily due to restricted sporting and physical activity opportunities (Law, &

Lach, 2008; Majnemer et al., 2008; Murphy & Carbone, 2008; Shikako-Thomas et al, 2008).

Opportunities that are available tend to be home-based (Shikako-Thomas et al., 2008) and afford fewer social engagements (Brown & Gordon, 1987). Youth with disabilities also encounter many barriers to participation (Rimmer & Rowland, 2008) such as inaccessible environments (Nary, Froehlich, & White, 2000) and fewer programs that target appropriate exercise options (Rimmer, Riley, Wang, Rauworth, & Jurkowski, 2004).

### **Barriers to Participation among Children with Disabilities**

Children and youth without disabilities have the opportunity to obtain regular physical activity during formal and informal play, transportation (e.g., bike riding to school), work, and structured exercise programmes (Fox & Riddoch, 2000). Murphy and Carbone (2008), however, suggest that active participation in physical recreation activities is less accessible to children with disabilities. As no guidelines exist for ensuring children access to community based recreation programs, intramural programs, or public sports programs, opportunities for participation are not as accessible or inclusive for children with disabilities as they are for their typically developing peers (Kasser & Lytle, 2006). This is rather concerning as “the lack of effective community-based exercise programmes for youth with disabilities limits opportunities for improvements in health and function in their respective communities” (Rimmer & Rowland, 2008, p. 144).

Fragala-Pinkham, Hayley, and Goodgold (2006) noted that developing safe and effective community-based fitness programmes for youth with disabilities presents unique challenges as adaptive exercise equipment, suitable and specifically designed fitness assessments, behavioural management considerations, and medical precautions may be required. In fact, a lack of nearby facilities or programs is the third most frequently identified barrier to active participation for children with disabilities at 10% (King et al., 2003). Furthermore, long-term sustainability of

such programs requires adequate staff, a necessity that appears to be lacking (Messent, Carlton, & Long, 1999). Limitations to sport and physical opportunities within communities are also linked to physical, programmatic, and attitudinal restrictions among children with disabilities (Murphy & Carbone, 2008). Common physical barriers for youth with disabilities in fitness/recreation venues such as fitness centers, swimming pools, parks, and trails include a lack of curb cuts, inaccessible access routes, doorways being too narrow for wheelchair access, facility front desk being too high for persons in wheelchairs to communicate with the person at the desk, and a lack of elevators. Safety issues such as slippery floors and the absence of handrails on stairs also create barriers to participation (Rimmer et al., 2004). Programmatic barriers include inaccessible exercise equipment, and inadequately trained fitness and exercise staff who are unfamiliar with how to adapt the game or sport to accommodate individual needs (Schreiber, Marchetti, & Crytzer, 2004). High-level competition and a prominent emphasis on winning are significant attitudinal barriers that discourage coaches and directors of community recreation programs from including children with disabilities. Parents of children who possess exceptional athletic skills often want their child to excel in sports and consequently deter the inclusion of youth with disabilities in community sports programmes (Rimmer & Rowland, 2008). As a result, “parents of youth with disabilities often want to protect their child from participating in competitive activities that may result in failure or verbal abuse by other children” (Rimmer & Rowland, 2008, 144). Many individuals with disabilities may also experience social isolation (Blum, Resnick, Nelson, & St Germaine, 1991) and negative societal stereotypes (King, Cathers, Polgar, MacKinnon, & Havens, 2000), limiting participation in group physical activities. The attitudinal barriers experienced by this population contribute to the lack of awareness regarding available community programs and opportunities for participation (Murphy

& Carbone, 2008). “Although specialized programs are beneficial, the participation of children with disabilities with other children in community activities can reduce societal barriers” (Murphy & Carbone, 2008, p. 1059). In their review on risk and protective factors among children with chronic conditions and disabilities, Patterson and Blum (1996) proposed that protective social factors such as informal support and supportive social networks have a positive impact on activity levels of children with disabilities. Individuals with disabilities often cite being believed in and being accepted by others as critical factors for determining their success in life (King et al., 2000). The discouragement from physical activity and sport among children with disabilities is also apparent in the school environment (Rimmer & Rowland, 2008). Physical education teachers have been shown to limit opportunities for youth with disabilities in their classes because competition often dominates class time and non-disabled youth are not encouraged to include youth with disabilities on their teams (Murphy & Carbone, 2008). Likewise, youth with disabilities often engage in very little physical activity during school because of various barriers associated with participation that include inadequate facilities and a lack of suitable role models (Council on Sports Medicine and Fitness and Council on School Health, 2006). While it is required that schools adapt activities to suit the abilities of each child, more than three fourths of elementary, junior/middle, and senior high schools allow students with cognitive and physical disabilities to be exempted from required physical education (Murphy & Carbone, 2008). Other physical activity barriers among children with disabilities include time and motivation in addition to the physical limitations of the impairment for those with physical disabilities (Froehlich-Grobe & Lollar, 2011). In fact, according to the Canadian Health and Activity Limitation Survey (Statistics Canada, 1995), the most frequently identified barriers to active participation among youth with disabilities aged 15 years and over are lack of

physical ability (18%) and high costs (15%). Participation is further influenced by the presence or absence of strong external support systems such as schools, communities (Garmezy, 1985), and supportive social networks (Patterson & Blum, 1996), as well as by the supportiveness of the home environment and family demographics, and family and child preferences for recreation (King et al., 2003). The presence of friends with whom to engage in the activity promotes participation (Allison, 1996). Overall, factors influencing participation in physical activities among children with disabilities are apparent at environmental, family, and personal levels (King et al., 2003).

The Council on Children with Diabetes Executive Committee of the American Academy of Pediatrics (AAP) recommends that physical activity participation be increased among youth with disabilities by addressing and reducing overall misconceptions, as well as attitudinal and societal barriers to the participation of children with disabilities in athletics (Murphy & Carbone, 2008). The AAP also encourages health professionals to understand the benefits of participation in sports and physical activities for children with disabilities, to be aware of the resources regarding appropriate physical activity options in local communities, and to advocate for greater participation in sports and physical activities for all children, including those with disabilities (Murphy & Carbone, 2008). In order to do this, however, it is imperative to understand how the personal impairments experienced by children with disabilities impact their ability to participate in physical activity.

### **Self-Efficacy and Perceptions of Physical Competence**

Integral to the adoption and maintenance of physical activity is self-efficacy (Valos et al., 2008). Perceived self-efficacy is defined as “a judgement of one’s capability to accomplish a certain level of performance” (Jeng & Braun, 1994, p. 426) and an efficacy expectation is the

“conviction that one can successfully execute the behaviour required to produce the outcomes” (Bandura, 1977, p. 193). Self-efficacy has been linked to motivation for change, intention to act, and empowerment (Farkas, 2011). Self-efficacy judgments may differ in magnitude, strength, and generality. Magnitude refers to the perceived level of difficulty of a particular task (Bandura, 1977). Strength refers to the level of perseverance one has to perform successfully despite disconfirming experiences, and generalization refers to the degree that self-efficacy expectations span across behavioural domains or across time (Bandura, 1977). “Judgments of self-efficacy determine how much effort people will extend and how long they will persist in the face of obstacles or adverse experiences” (Bandura, 1982, p. 123). There is often confusion, however, between the concept of self-efficacy and Theory of Self-Efficacy. It is possible for self-efficacy, as a concept, to be utilized in clinical practice to consider client traits, goals, and outcomes (Farkas, 2011). “However, it is the Theory of Self-Efficacy – the processes and relationships among concepts – that provide a powerful tool to develop knowledge and to foster personal and social change” (Farkas, 2011, p. 429). Fundamentally, Self-Efficacy Theory posits that performance and motivation are partially determined by how effective people believe they can be (Bandura, 1982). As children are exposed to a multitude of experiences, tasks, and situations, developmental progression occurs in the links between children’s self-efficacy beliefs and their own behaviors (Davis-Kean et al., 2008). Given this notion, self-efficacy will continue to evolve over the lifespan as new skills, experiences, and understandings are acquired. According to Bandura (1978), expectations of personal efficacy are based on four major sources of information: performance accomplishments, vicarious experiences, verbal persuasion, and emotional arousal. These components allow individuals to determine whether they believe they are capable of accomplishing specific tasks. Williams and Williams (2010) note, “individuals

with high levels of self-efficacy approach difficult tasks as challenges to master rather than as threats to be avoided” (p. 455).

### *Performance Accomplishments*

As this source of efficacy is based on personal mastery experiences, it is regarded as especially influential. “Successes raise mastery expectations; repeated failures lower them, particularly if the mishaps occur early in the course of events” (Bandura, 1978, p. 143). It is, however, possible to reduce the negative impacts of occasional failures as repeated successes contribute to the development of strong efficacy expectations (Bandura, 1978).

### *Vicarious Experiences*

Upon witnessing others perform activities, people persuade themselves that if others can do it without negative consequences, they should be able to achieve at least some improvement in performance if they intensify and persist in their efforts (Bandura, 1977). Vicarious experience is considered a less dependable source of information about one’s capabilities as it relies on inferences from social comparison (Bandura, 1978).

### *Verbal Persuasion*

Through suggestion, people are led into believing they can cope successfully with what was previously considered overwhelming. A positive relationship exists between credibility and the effectiveness of verbal persuasion, where sources regarded as more credible will ultimately produce greater influence (Bandura, 1978). Although verbal persuasion is widely used because of its ease and ready availability, “efficacy expectations induced in this manner are also likely to be weaker because they do not provide an authentic experiential base” (Bandura, 1978, p. 145).

### *Emotional Arousal*

Anxiety and vulnerability to stress are in part judged by states of physiological arousal. Because high arousal can debilitate performance, expectations of success are likely to be higher when one is not beset by aversive arousal (Bandura, 1978). Bandura (1995) also notes, however, that "it is not the sheer intensity of emotional and physical reactions that is important but rather how they are perceived and interpreted" (p.5). Understanding how to minimize stress and maximize ease when faced with overwhelming tasks can improve one's sense of self-efficacy as "perceived inefficaciousness in coping with potential threats lead people to approach such situations anxiously and experiencing disruptive arousal may further lower their sense of efficacy that they will be able to perform skillfully" (Bandura, 1982, p. 140).

Self-efficacy towards a task determines if an individual will attempt the behaviour and to what extent he/she will persist in the face of obstacles (Bandura, 1977). Thus, efficacy expectations can become self-fulfilling prophecies, "the stronger the perceived self-efficacy, the more active the efforts" (Bandura, 1977, p. 194). Positive outcomes of these active efforts enhance self-efficacy, which consequently influences the individual's perception of her/his competence (Mazzoni, Purves, Southward, Rhodes, & Temple, 2009).

Competence has been described as the ability to interact effectively with the environment (White, 1959). The human being is inherently compelled, in this view, to engage in mastery attempts (van Rossum & Vermeer, 1990), or in other words, to attempt to master a skill or activity in their environment (Weiss & Amorose, 2008). "This yields feelings of efficacy and control over one's own behaviour" (van Rossum & Vermeer, 1990, p. 71). As noted by van Rossum and Vermeer, the notion of competence was later revived in the context of the work of Susan Harter (1978). Harter and her colleagues focused primarily on school-aged children

between the ages of 8-15 years (van Rossum & Vermeer, 1990). It is of importance to note that the notion of *perceived competence* was proposed and was investigated as the “personal impression of one’s capabilities within a competence-domain” (van Rossum & Vermeer, 1990, p. 72). Based on these works, the most recent measurement of competence is assessed on five domains: scholastic competence, social acceptance, athletic competence and physical appearance (physical competence), behavioural conduct, and a separate global self-worth scale (Harter, 1985a). These items make up the Perceived Competence Scale (Harter, 1985a). Thus, perceived competence is based on the aspects of daily life where one forms competency judgements. In each of these aspects, we are more or less satisfied with ourselves; however notably, do not feel equally competent in every domain (Harter, 1982). Harter’s model of perceived competence highlights the importance of perceptions of competence in motivational processes (Sollerhed et al., 2008), where high perceptions of competence intrinsically motivate the pursuit of challenge while enhancing persistence and lessening anxiety during involvement (Harter, 1985b).

While five domains comprise the Perceived Competence Scale, the current study focuses solely on the physical domain, or in other words, perceptions of physical competence. The domain of physical competence is comprised of perceived athletic competence and physical appearance (Harter, 1985a). The current study focuses solely on perceptions of athletic competence to characterize and comprise this domain. Perceptions of physical competence seemingly influence both physical achievement and motivational orientation (Sollerhed et al., 2008) as children are inclined to both behave and to interpret their experiences in such a way that confirms self-judgements and expectations (Weiss & Ebbeck, 1996).

Low perceptions of self-efficacy (Valos et al., 2008) and physical competence in combination with poor levels of fitness pose a high risk factor for future physical inactivity

among children (Sollerhed et al., 2008). Conversely, a good physical status in combination with high self-efficacy and perceptions of physical competence (Bauman et al., 2012) is potentially advantageous in regards to future physical activity participation (Sollerhed et al., 2008). Salmon, Brown, and Hume (2009), conducted a review of 19 studies that reported intervention effects on physical activity and mediators of behavioural change among children 4-12 years of age. Of the potential mediators reported in this review, self-efficacy was among the most commonly cited (Salmon et al., 2009). An additional study by Craggs, Corder, van Sluijs, and Griffin (2011), concluded that among children aged 10–13 years and adolescents aged 14–18 years, higher levels of self-efficacy resulted in smaller declines in physical activity compared to lower levels of self-efficacy. Using longitudinal data, Stein, Fisher, Berkey, and Colditz (2006), outlined a positive association between physical activity and both social and physical self-perception scores among children; the odds of improving self-perception scores were over 30% higher in those who increased physical activity, compared to those with minimal or no activity change. Conversely, a decrease in physical activity was associated with poorer physical and social self-perception scores (Stein et al., 2006).

It is of concern that children with disabilities, particularly those with poorer motor skills (Piek, Dworcan, Barrett, & Coleman, 2000), have been shown to have lower perceptions of their physical competence (Piek et al., 2000; Renick & Harter, 1989). Piek et al. revealed that children with developmental coordination disorder (DCD) have lower self-perceptions in the domain of physical competence than a matched group of normally coordinated children. Further, among a cohort with movement difficulties, those with fewer gross motor skills had poorer perceived physical competence (van Rossum & Vermeer, 1990). As they view themselves as less physically adequate than their typically developing peers, developing a positive view of the self

may be challenging for children with physical disabilities (Kinn, 1964). There is, however, evidence that perceptions of physical competence are modifiable with physical activity (Ninot, Bilard, Delignières, & Sokolowski, 2000). Mazzoni et al. (2009) conducted a study to examine a 6-week indoor rock-climbing program on perceptions of self for children with special needs. Authors posited that “successful climbing experiences should influence self-efficacy appraisals of basic tasks associated with climbing which in turn may influence general feelings of physical competence, social competence, and global self-worth” (Mazzoni et al., 2009, p. 261). Their findings demonstrated that self-efficacy toward climbing increased significantly; however, perceptions of physical competence did not (Mazzoni et al., 2009). The authors suggested that the program, consisting of six 1-hour sessions of climbing, was not a sufficient condition to increase the children’s perceptions of physical competence. Repetitive and sustained experiences of success in a differing physical activity, however, may prove otherwise. Therefore, the possibility of improving this competency through bike riding, an activity that offers the potential for increased access at home, is of interest.

### **The Importance of Bicycling**

Bicycle riding is an important activity in the social and physical lives of most children (Klein et al., 2005). It contributes to “the building of self-esteem, positive relations, the development of strength, stamina, coordination, and overall well-being [in addition to strengthening required skills] such as cognitive and perceptual motor skills, decision-making, judgment, and kinesthetic and spatial awareness” (Klein et al., 2005, p. 51). The bicycle is a popular method of active independent transportation and also affords recreational opportunities with family and peers (Klein et al., 2005). As indicated by Klein et al. the ability to ride a bicycle is “taken for granted as a societal norm” (p. 51). Bicycling also offers a potential source of

moderate-intense physical activity (Canadian Society for Exercise Physiology, 2011). Stanley, Ridley, and Olds (2011) found that among children 10-13 years old, cycling was the second most popular after-school physical activity of this intensity. Moreover, levels of leisure time physical activity are higher and the odds of being overweight or obese are lower among children who cycle to school (Østergaard et al., 2012). Østergaard et al. demonstrated that the odds of being overweight or obese among 12-16 year old students (n=3847) who cycled to school were 55% and 30% lower respectively compared to students who used passive transport. Research examining factors associated with children's bicycle riding behaviour, however, is limited (Temple et al., 2011). Furthermore, the research that does exist does not focus on bicycle riding as a recreational activity, but rather on the environmental correlates of active transport to school (de Vries, Hopman-Rock, Bakker, Hirasing, & van Mechelen, 2010). The individual-level correlates associated with cycling to school include being older and/or being male (Chang & Chang, 2008). Chang and Chang note that these characteristics indicate a higher skill level and a greater ability to safely ride a bicycle. Social correlates of cycling to school include: support from parents and friends, parental perceived inconvenience of driving children to school, and parental absence at home before or after school (Panter, Jones, van Sluijs, & Griffin, 2010). Cycling to school has also been positively associated with physical environmental features including a shorter route to the school (Panter et al., 2010), residing in a metropolitan area (Chang & Chang, 2008); and perceptions of low/safe traffic (Chang & Chang, 2008; Panter et al., 2010), appropriate lighting and weather conditions (Chang & Chang, 2008), a safe neighborhood en route to school (Panter et al., 2010), neighborhood sense of community (Panter et al., 2010), and high walkability (Panter et al., 2010). As identified by Temple et al. (2011), to

date there are no descriptive studies that have examined factors associated with a child's health condition or functioning in relation to cycling.

### **Bicycling among Children with Disabilities**

Typically, only 10% children with Down syndrome and 20% of those with autism acquire the skills to ride a two-wheeled bicycle successfully (Lose the Training Wheels, 2010).

Unfortunately, literature concerning how to teach bicycle-riding skills to children, particularly with disabilities, is limited (Klein et al., 2005). Training wheels represent a well-recognized and accepted methodology in our culture for transitioning from a balanced multi-wheeler to a freestanding bicycle (Klein et al., 2005). In many instances, however, and particularly among children with disabilities, training wheels become a crutch that prevent further transition, as a result of bad riding habits as well as fear (Klein et al., 2005). Typical poor riding traits include "stiff arms, a hunched-over posture, a downward stare, and excessive reliance on upper torso leaning in response to sensations of instability" (Klein et al., 2005, pg. 51). Failure to ride, frustration, and even injury may occur as a result of riding with training wheels (Klein et al., 2005). In reference to potential social opportunities, an age appropriate motor skill and activity such as two-wheeled bicycling supports opportunities for children to practice basic social skills (MacDonald et al., 2011).

### **Lose the Training Wheels**

In response to the lack of success with bicycle riding among children with disabilities, Dr. Richard Klein, a professor of engineering at the University of Illinois at Urbana-Champaign developed an adapted bicycle-riding program (Temple et al., 2011). Delivered in a camp format, Lose the Training Wheels (LTTW) affords children with disabilities the opportunity to "ride a conventional two-wheel bicycle and become lifelong independent bicycle riders" (Lose the

Training Wheels, 2011, unspecified page) by changing the dynamics of the bicycle and the demands of the environment (Temple et al., 2011). This achievement, in turn, “creates a gateway of opportunity, helping them gain assurance and self-reliance in many other aspects of their lives” (Lose the Training Wheels, 2011, unspecified page). The LTTW camp aims for successful, independent riding after five days of 75-minute daily riding sessions (Lose the Training Wheels, 2011).

The concept of LTTW is to incrementally progress from a stable, adapted bike to a standard two-wheeler via specially designed crowned roller adjustments that replace the back wheel (Klein et al., 2005). Unlike training wheels, these rollers afford the rider the ability to tip or lean safely (Klein et al., 2005). Despite sacrifices in agility, the first series of bicycles retain the highest level of stability; they do not fall over even if the rider makes faulty movements (Klein et al., 2005). A series of tapered rollers with fewer tendencies to stabilize faulty riding habits eventually replace crowned rollers until standard wheels are progressively achieved (Klein et al., 2005). As the motor responses to remain stable and controlled are learned, the bicycle’s dynamics are steadily adjusted to increase the challenge. The rider assumes more responsibility for the maintenance of balance through the use of “increased visual discrimination as well as steering actions, and as a corollary, enjoys increased manoeuvrability” (Klein et al., 2005, p. 52). Progression is tailored in accordance with individual needs (Klein et al., 2005).

Early skill development centres on mounting the bicycle, attaining comfort in pedaling, and maintaining balance through effective steering (Klein et al., 2005). Once basic riding skills have been achieved, pedaling and breaking are addressed (Klein et al., 2005). Children are engaged in additional tasks such as “navigating figure eights, riding within defined lines using cones, and coming to a controlled stop at an identified line” (p. 53) once comfort in riding a two-

wheeled bicycle is achieved (Klein et al., 2005). Instruction and cycling skills are practiced on a spacious floor area with minimal obstructions, rather than constricted paths like sidewalks (Klein et al., 2005). If time and facilities permit, however, instructors lead and assist children in riding on bicycle paths outdoors (Klein et al., 2005).

Each child is assigned one or two volunteers who serve as “spotters” to provide physical support, motivation, and encouragement (Lose the Training Wheels, 2011). It is not the volunteers, however, that do the teaching but rather the adapted bicycles themselves (Klein et al., 2005). As opposed to traditional methods of instruction (explanations and demonstrations), children develop control through their physical and visual experiences while riding (Klein et al., 2005). Furthermore, as several children are frequently present in the teaching area and rates of progression differ, they typically benefit from the modeling of peers (Klein et al., 2005).

The instructional methodology is based on Dynamic Systems Theory, which “supports the concept that learning results from the interaction between an individual, the task, and the environment” (Klein et al., 2005, p. 52). Specifically, to facilitate a learning experience, the task and/or the environment are altered (Gagen & Getchell, 2004). LTTW alters the task by affording an adapted bike that provides stability while retaining the dynamic features of a traditional two-wheeler. The task is also altered by incrementally increasing the challenge to suit individual needs. The environment provides one-on-one facilitation, specialized instructional methods, and the experience in a camp setting. It is important to note that, “the primary difference for children with disabilities is that learning may require additional time and specialized teaching strategies” (Klein et al., 2005, p. 50). LTTW successfully accommodates both of these factors.

In addition to the inherent joy experienced from gaining the ability to ride a bicycle, the general benefits for children participating in this program are inclusion, increased self-esteem

and self confidence, positive change in family dynamics, independent transportation, improved quality of life via active involvement in recreation, increased self confidence in physical capabilities, and social time for children to meet and support peers in their community (Lose the Training Wheels, 2011). A study by MacDonald et al. (2011) highlighted the social implications of learning to ride a bike via an adapted physical activity program in children with Autism Spectrum Disorder (ASD). “Youths in this study generalized social skills based on their abilities to ride two wheeled bicycles; these skills included independence, confidence, positive emotions and successful coping strategies” (MacDonald et al., 2011, p. 41). Two-wheeled cycling assisted in the practice of daily social situations and enhanced peer and family relationships, as families did not have to make accommodations for their children with ASD in order to participate in a collective activity (MacDonald et al., 2011).

In 2011, LTTW conducted more than 85 camps in Canada and the USA (Lose the Training Wheels, 2011). The immediate end-of-camp outcomes have been investigated by Klein et al. (2005), who found that 70% to 80% of children who attended were able to ride a bicycle independently by the conclusion of the camp. Burt, Porretta, and Klein (2007) highlighted the progressions of seven children with a mild intellectual disability who completed a LTTW camp and found that all seven children were able to ride a two-wheeled bike for 12 meters by the end of camp. Seventy one percent of these children maintained the skills 2-3 days following the camp, and an additional 43% were able to generalize their new cycling skills to an altered task in the same environment (Burt et al., 2007). More recently, MacDonald et al. (2012), reported that 73% of children with Down syndrome and 85% with ASD successfully demonstrated the ability to ride the bicycle more than 100 feet after five days of camp. An additional study by Ulrich, Burghardt, Lloyd, Tiernan, and Hornyak (2011), examined physical activity outcomes of pre-

intervention LTTW, at 7 weeks after LTTW, and at 12 months following LTTW among children 8 to 15 years of age who had been diagnosed with Down syndrome. The results indicated that 56% of children learned to ride a two-wheeled bicycle during the five-day intervention, and further analysis showed that participants who learned to ride spent significantly less time in sedentary activity at 12 months after the pre-intervention measurement and more time in moderate to vigorous physical activity. Body fat also appeared to be positively influenced over time in participants who learned to ride (Ulrich et al., 2011).

The popularity and encouraging outcomes of LTTW led Temple et al. (2011) to investigate the retention and generalization of these newfound cycling skills to the home environment and to further investigate the factors that facilitated or hindered a child's cycling success. Two distinct categories of post-camp riding: 'Rider' and 'Not There Yet' were identified. The children 'Not There Yet' represented the 20% of children who did not succeed in riding a two-wheeler by the conclusion of the five-day camp. Factors that facilitated or hindered a child's cycling success at home included: the natural and built environment (nowhere to ride at home), support and relationships (parents not knowing how to help their children), attitudes (children not wanting to try), services, systems and policies (extension of the program, a guide or plan for those who weren't independent), and personal factors (child's fear) (Temple et al., 2011).

In summary, LTTW is a successful program that affords children with disabilities the opportunity to learn to ride a two-wheeled bicycle. As bicycle riding has an important role in childhood and offers a source of moderate-to-vigorous physical activity, it is important to provide this population with the opportunity to acquire these skills. Additionally, an age-appropriate skill and social activity paired with age-matched peers promote the opportunity for

peer interaction and in turn, the development of social skills (Vaughn, 2003). Lose the Training Wheels appropriately and effectively addresses these factors.

### **Components of the International Classification of Functioning, Disability and Health Model**

The International Classification of Functioning, Disability and Health (ICF) model (see Figure 1) is based on an integration of two opposing models, the medical model and the social model (WHO, 2007). The medical model deems disability as a problem of the person, caused directly by disease, trauma, or other health conditions. Disability management operates on an individual level, aiming for a cure or the individual's adjustment and behaviour modification, and requires treatment by professionals (WHO, 2007). Conversely, the social model views disability not as an individual attribute but as a complex collection of socially created conditions. Disability management is "a matter of full integration of individuals into society" (WHO, 2007, p. 18) and as such, it is the responsibility of larger society to manage disability by making the environmental modifications necessary to promote full participation in all social areas (WHO, 2007). In order to achieve synthesis, the ICF uses a "biopsychosocial" approach to integrate both perspectives of functioning (WHO, 2007) and provides a "coherent view of health from a biological, individual, and social perspective" (WHO, 2007, p. 19). The following section outlines the components and interactions of the ICF, and introduces the International Classification of Functioning, Disability and Health – Children and Youth version (ICF-CY) as it frames the current study.

The ICF is a classification of health and health-related states (WHO, 2002) and "offers a conceptual framework for understanding functioning and disability" (McDougall et al., 2010, p. 204). In this framework, functioning and disability are umbrella terms that encompass all body functions and structures, activities, and participation (WHO, 2007). It is important to note that

each component can be expressed in both positive and negative terms (WHO, 2007), as highlighted in the following definitions. Body structures are “anatomical parts of the body such as organs, limbs, and their components” whereas body functions are physiological, anatomical, and psychological functions of body systems” (WHO, 2002, p. 9). An ‘impairment’ is “a problem in body functions or structures such as significant deviation or loss” (WHO, 2002, p. 10). Activity is the “execution of a task or action by an individual” (WHO, 2002, p. 10) and ‘activity limitations’ are difficulties a person may have in carrying out daily activities (WHO, 2002). Participation is defined as “the involvement in life situations or tasks” (WHO, 2002, p. 10) and ‘participation restrictions’ “are problems a person may experience when involved in life or social situations” (WHO, 2007, p. 9). As the current study focuses on the participation in bicycle riding, it is important to note that the term “participation” is defined by the World Health Organization as the nature and extent of a person’s involvement and function in life situations and includes the domains of learning and applying knowledge, general tasks and demands, communication, mobility, self-care, domestic life, interpersonal interactions and relationships, major life areas, and community, social, and civic life (WHO, 2007). Participation in activities is the context in which children develop skills and competencies, social relationships, and long-term mental and physical health (Larson & Verma, 1999; Simeonsson, Carlson, Huntington, McMillen, & Brent, 2001). Children with disabilities tend to be more restricted in their participation than typically developing peers: a gap that widens in early adulthood (King et al., 2003).

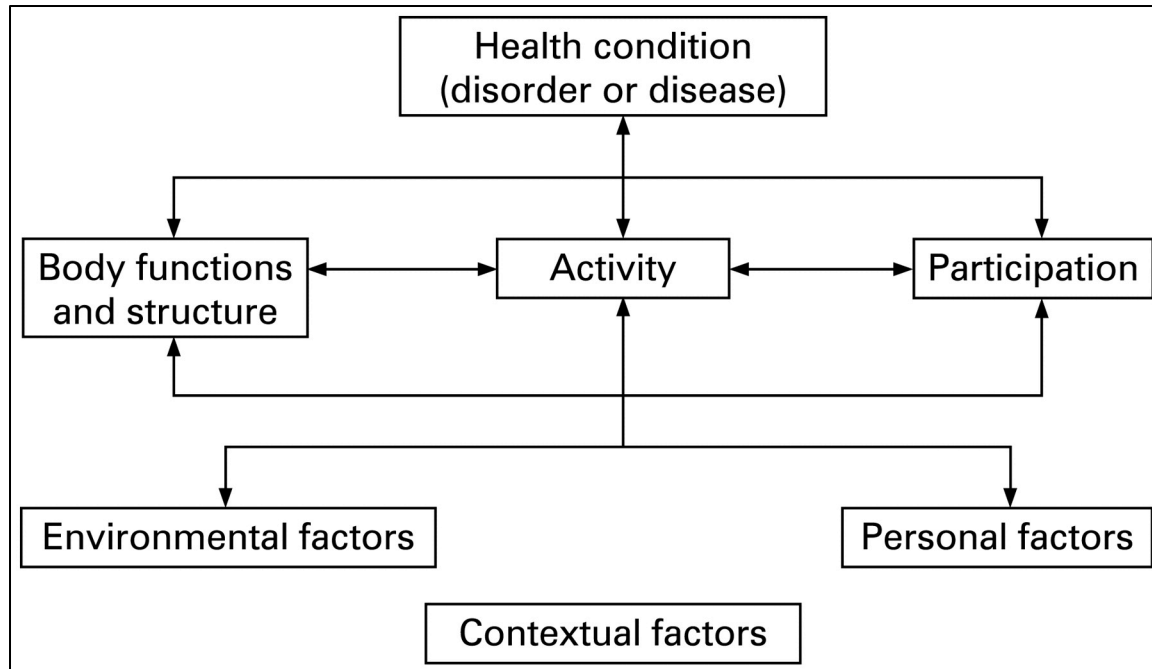


Figure 1. *Components of the ICF Model* (World Health Organization, 2007).

Figure 1 models that “an individual’s functioning [and disability] in a specific domain is an interaction or complex relationship between the health condition and contextual factors (i.e. environmental and personal factors)” (WHO, 2007, p. 17). There is a dynamic interaction between these two entities: interventions in the health condition have the potential to modify one or more contextual factor component and vice versa. Figure 1 demonstrates the role that contextual factors play in the process. “These factors interact with the individual with a health condition and determine the level and extent of the individual’s functioning” (WHO, 2007, p. 17). Environmental factors are extrinsic to the individual and can have a positive or negative influence on an individual’s functioning within society, on an individual’s ability to perform actions or tasks, or on the individual’s body function or structure (WHO, 2007). Two levels, individual and societal, classify environmental factors, each with a differing focus. Individual environmental factors are in the immediate home environment of the individual (i.e. home,

workplace, and school) and include physical and material features of the environment, as well as direct contact with others (i.e. family, peers, and strangers) (WHO, 2007). Societal factors are “formal and informal social structures, services, and overarching approaches or systems in the community or society that have an impact on individuals” (p. 15) and include features such as work related organizations and services, community activities, communication or transportation services, social networks, as well as laws, formal and informal rules, and attitudes and ideologies (WHO, 2007). The presence of environmental conditions makes it possible for the “identification of environmental barriers and facilitators for both the capacity and performance of actions and tasks and in daily living” (WHO, 2002, p. 8). Personal Factors are demographic and descriptive in nature and comprise features of the individual that are not part of the health condition or state (WHO, 2007). Personal factors influence how the individual experiences disability and include social background, education, profession, fitness, lifestyle habits, coping styles, past and current experience, and other such factors (WHO, 2002; 2007).

The International Classification of Functioning, Disability and Health - Child and Youth Version (ICF-CY) (WHO, 2007) was published in 2007. This model is based on the ICF, but is intended for use “across disciplines, government sectors, and national boundaries to define and document characteristics of health, functioning, and development in children and youth” (WHO, 2007, p. xii). With its emphasis on functioning, “the ICF-CY offers a conceptual framework and a common language and terminology for recording problems manifested in infancy, childhood, and adolescence” (p. xii) involving impairments in body functions and structures, activity limitations and participation restrictions, and contextual factors important for children and youth (WHO, 2007). The ICF-CY adds the term ‘developmental delay’ to the ICF’s universal severity scale (McDougall et al., 2010) to account for the individual differences in growth and

development and the associated time variations in the emergence of body functions, structures, and the acquirement of skills (WHO, 2007). Lags in the emergence of functions, structures, or capacities are not necessarily permanent but do reflect developmental delays (WHO, 2007).

In summary, this model is used to understand how body functions and structures, activities, and participation interact with each other and how they are influenced by environmental and personal conditions (WHO, 2007). The ICF uses the term functioning to describe all body functions and structures and the performance of activities and participation in communal life (Simeonsson et al., 2003) and uses all domains to capture a complete view of the human experience when living with a disability (WHO, 2007). The modified ICF-CY model, a model intended to define and document characteristics of health, functioning, and development in children and youth (WHO, 2007), is utilized as a framework in the current study. The following section focuses specifically on the body functions and structures component of the ICF-CY model.

Body functions and structures are classified in two different sections and are designed for use in parallel (WHO, 2007). For instance, “body functions include basic human senses such as ‘seeing functions’ and their structural correlates exist in the form of ‘eye and related structures’” (WHO, 2007, p. 11). An anomaly, defect, loss, or other significant deviation in body structures is classified as an ‘impairment’ and can be “temporary or permanent; progressive, regressive or static; intermittent or continuous” (WHO, 2007, p. 11). Slight or severe deviations from the population norm are possible, as are fluctuations in impairment over time (WHO, 2007). The following section describes common impairments in body functions and structures of three conditions (Autism Spectrum Disorder [ASD], Global Developmental Delay, and Intellectual Disability [ID]) prevalent among the 2012 LTTW participants.

Autism Spectrum Disorder is characterized by impairment in social interaction and communication difficulties, and is often associated with unusual behavior such as highly restricted interests and repetitive behavior (i.e. arranging objects, hand flapping, body rocking) (College Pediatric Therapy, 2010a). Impairment in social interaction is characterized by difficulty expressing nonverbal behaviours (i.e. eye contact, facial expression, and body language) to regulate social interactions, limited or no peer relationships appropriate to developmental level, a lack of spontaneous seeking to share enjoyment, interests, or achievements with others, little or no social reciprocity (i.e. not actively participating in simple social play), and absence of social judgment (American Psychiatric Association, 2000). Communication difficulties affect both verbal and nonverbal skills and are characterized by a delay or total lack of development of spoken language, an impairment in the ability to sustain a conversation, repetitive use of language or idiosyncratic language, or a lack of spontaneous imaginative play appropriate to developmental level (American Psychiatric Association, 2000). In reference to restricted, repetitive, and stereotypic behaviours, individuals with ASD may display a preoccupation with stereotyped or restricted interests or topics, strict adherence to specific routines, repetitive motor mannerisms, and persistent preoccupation with parts of items or an attachment to inanimate objects (i.e. a piece of string or a rubber band) (American Psychiatric Association, 2000). Symptoms of ASD can range from mild to severe, as denoted by the term "spectrum" (College Pediatric Therapy, 2010a).

Global developmental delay (GDD) is defined as a significant delay in two or more of the following domains: gross/fine motor, speech and language, cognition, social/personal behaviour, and activities of daily living (Majnemer & Shevell, 1995). Due to limitations in cognitive functioning, children with GDD learn and develop at a slower rate, however with repetition and

adapted tools, learning and development are possible (College Pediatric Therapy, 2010b). Children with severe GDD also require more intensive support and supervision (College Pediatric Therapy, 2010b).

According to the American Association on Intellectual and Developmental Disabilities (AAIDD), intellectual disability “is a disability characterized by significant limitations both in intellectual functioning and in adaptive behaviour as expressed in conceptual, social, and practical adaptive skills” (AAIDD, 2010, p. 1). ID is diagnosed using assessment information from standardized and individually administered instruments that assess intellectual functioning and adaptive behaviour (AAIDD, 2010) and is characterized by the following criteria: significantly sub-average general intellectual functioning that is accompanied by significant limitations in adaptive functioning in at least two of the following skill areas: communication, self-care, home living, social/interpersonal skills, use of community resources, self-direction, functional academic skills, work, leisure, health, and safety. The onset must occur before age 18. According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR), four degrees of ID severity can be specified, reflecting the level of intellectual impairment: mild, moderate, severe, and profound, and correspond roughly to intelligence quotient (IQ) scores (American Psychiatric Association, 2000). Those with mild ID (IQ level 50-55 to approximately 70) typically develop social and communication skills, have minimal impairment in sensorimotor areas, and can acquire academic skills up to approximately the sixth-grade level. Those with moderate ID (IQ level 35-40 to 50-55) acquire communication skills during early childhood years, however, experience difficulties in recognizing social conventions and are unlikely to progress beyond the second-grade level in academic subjects. The group with severe ID (IQ level 20-25 to 35-40) acquire little or no communicative speech but they may learn to talk during

childhood and can be trained in elementary self-care skills. Those with profound ID (IQ level below 20-25) display considerable impairments in sensorimotor functioning in early childhood. Motor development and self-care and communication skills may improve if appropriate training is provided and some can perform simple tasks in closely supervised and sheltered settings (American Psychiatric Association, 2000).

In summary, international evidence suggests that children with disabilities are not meeting the recommended levels of physical activity and have lower levels of activity than their typically developing peers. Children with disabilities experience activity limitations and participation restrictions associated with their impairment and limited opportunities. Prior physical activity experiences tend to be negative and often contribute to low self-efficacy toward participation and poor perceptions of physical competence. However, both self-efficacy and perceptions of physical competence are amenable to change given appropriately supportive environments. Prior research has shown that the LTTW program is an efficacious approach to teach children with disabilities to ride a two-wheeled bicycle. However, to date these studies have examined fairly immediate end of camp outcomes. This study expands on previous work by investigating how children's bike riding progresses during the five day camp, and the impact that the children's emerging skills have on their self-efficacy toward riding a two-wheeled bicycle and their perceptions of physical competence. Further, the extent to which the skills learned at camp transfer to home have not been examined; nor have the barriers and facilitators for riding after camp. This study examined facilitators and barriers to bike riding at home using the ICF as an organizing framework; thereby providing insight into how the development of the child's skills at camp interacted with their home context.

## CHAPTER 3

### Method

#### Study Design

This study employed a quasi-experimental, mixed-methods research design. A mixed-methods approach is defined as “the collection and analysis of both quantitative and qualitative data in a single study in which the data are collected concurrently or sequentially, are given a priority and involve the integration of the data at one or more stages in the process of research” (Creswell, Plano Clark, Cutman, & Hanson, 2003, p. 212). Drawing on the assertions of Ivankova, Creswell, and Stick (2006), the rationale for implementing a mixed-methods design is grounded in the fact that neither a single qualitative or quantitative approach is sufficient to capture the trends of a particular study. As it is possible to capitalize on the inherent strengths of each approach, a combination of quantitative and qualitative methods allows for a more robust analysis of the data (Green, Caracelli, & Graham 1989). Considerations in mixed-methods research include the priority assigned to the quantitative and qualitative data collection and analysis (e.g., equal or unequal), the sequence of the data collection and analysis, and the stage(s) at which the quantitative and qualitative phases “mix” and the results are integrated (Creswell et al., 2003; Morgan, 1998). Priority refers to the weight or attention assigned to each approach, quantitative or qualitative (or both) and determines which approach acts as the principal tool throughout the data collection and analysis process (Creswell et al., 2003; Morgan, 1998). Implementation refers to the sequence or order in which quantitative and qualitative data are used. Collection and analysis may come by introducing the information in phases over a period of time (i.e. sequentially), or gathering the information at the same time (i.e. concurrently) (Creswell et al., 2003). Integration refers to the combination or mixing of quantitative and qualitative research within a given stage of inquiry (Creswell et al, 2003). It is possible for

integration to occur at any stage, from the formulation of the purpose and research questions (e.g., both quantitative and qualitative questions are presented) to the integration of the data at the interpretation stage (e.g., examining the quantitative and qualitative results for conjunction of findings) (Creswell et al., 2003). In the current study, quantitative data documenting changes in cycling skills, self-efficacy toward riding, and perceptions of physical competence were collected and analyzed, followed by qualitative data derived from interviews examining the transfer of cycling skills to home. Research question one utilized quantitative data from all 25 participants while research question two was strictly qualitative and utilized data from the 10 participants who completed the follow-up interview. Research question three was largely qualitative, however, examined self-efficacy toward riding a bicycle and perceptions of physical competence, and focused on the 10 participants who completed the follow-up interview. The quantitative data were largely used to inform qualitative findings, thereby utilizing a sequential explanatory design (Ivonkova et al., 2006). Due to the importance of bicycling as a part of an active and healthy lifestyle, priority was given to qualitative data. As per the sequential explanatory design, qualitative and quantitative data were integrated during interpretation as “quantitative data and their subsequent analysis provided a general understanding of the research problem and the qualitative data and their analysis refined and explained those statistical results by exploring participants’ views in more depth” (Ivonkova et al., 2006, p. 5). This approach afforded an opportunity for a more sophisticated understanding of the research questions (Hanson, Creswell, Plano Clark, Petska, & Creswell, 2005). To summarize, a mixed-methods approach extended this study’s results in order to identify trends, relationships, and correlations, and identify potential ongoing support strategies post-camp. Figure 2 provides a graphical representation of the mixed-methods procedure used in this study.

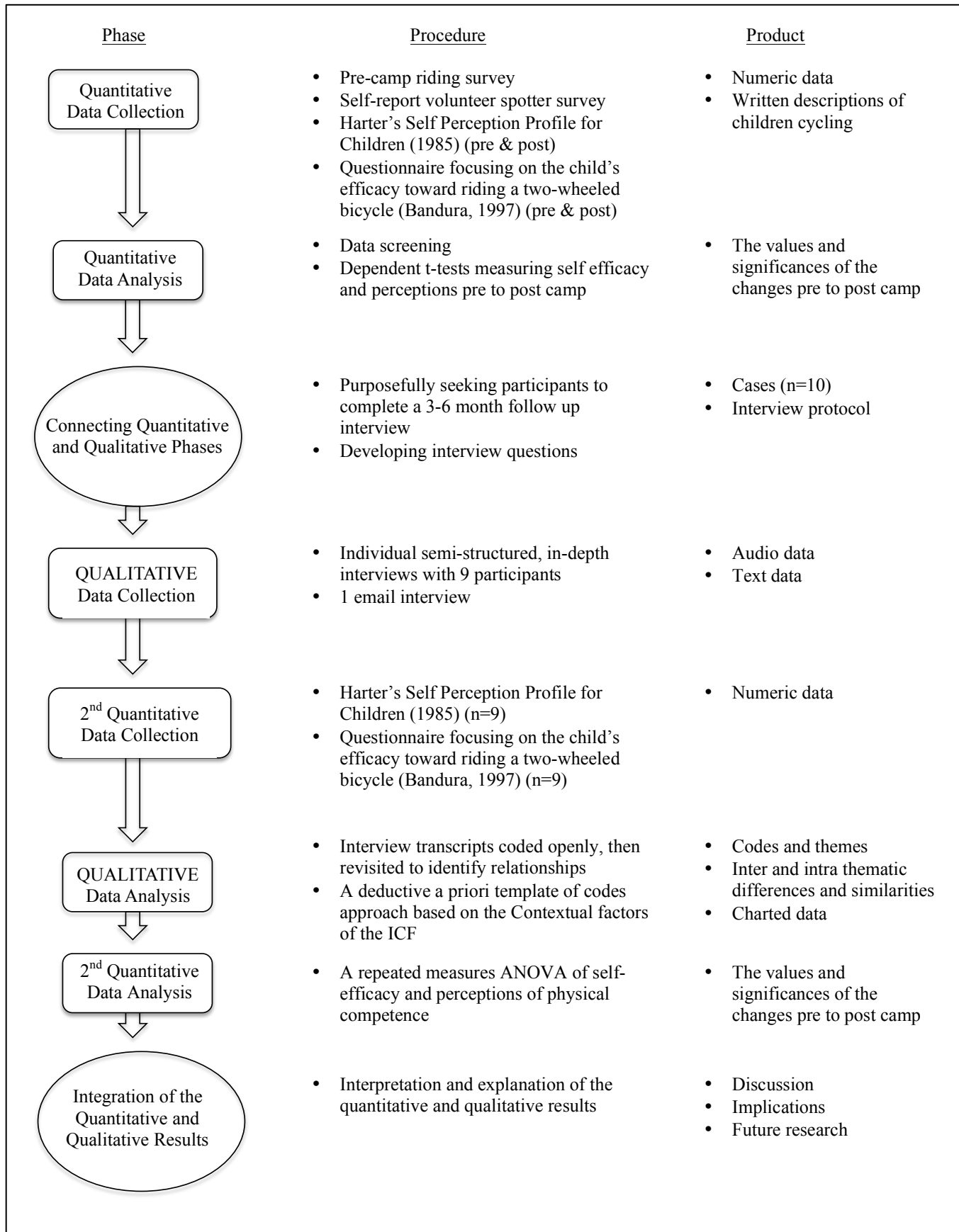


Figure 2. *Visual Model for Mixed Methods Procedure*

## Sample and Participant Selection

All children enrolled in the Queen Alexandra Centre for Children's Health (QACCH) 2012 bicycle camp were eligible to participate ( $n = 40$ ). The camp was offered as an adjunct to therapy, and all children enrolled for the camp were receiving physical therapy or occupational therapy services from the School Age Program of QACCH. Of the children enrolled in the camp, 25 children and their parents agreed to participate in the study. Sixty percent of the participants were male and the mean age was 9.8 years ( $SD = 2.6$ , range 7 - 18 years). Five participants were repeating the LTTW camp and the remaining 20 were attending for the first time. Camp enrollment records indicated that all participants had a disabling condition; the primary condition diagnosis is provided in Table 1. This study was approved by the University of Victoria and Vancouver Island Health Authority (VIHA) Joint Ethics Board (see Appendix A). The process of obtaining consent and assent included three methods of recruitment. Initially, the senior physiotherapist of QACCH sent an information package to all parents/care providers who had enrolled their child in LTTW. Included in the information package was an invitation to participate in the study (see Appendix B) and a consent form informing participants of the intent and purpose of the study, and the process of collecting information (see Appendix C). An assent form was also included as to attain consent from participants under the age of 18 (see Appendix D). When responding by mail, parents were asked to return the forms via the stamped addressed envelope enclosed in the information package. Consent and assent were also attained during a LTTW information session, prior to the commencement of the camp. At this session, parents and their children were given a brief verbal explanation regarding the study and the process of collecting data. Those who agreed to participate were given the information packages and were asked to bring the completed forms on the first day of camp. On the first day of LTTW, a third and final round of recruitment occurred in which parents were approached and spoken to individually about

the study. Those who agreed to participate signed the consent and assent forms following this brief explanation. As outlined in the consent form, parents were invited to participate in an optional follow-up interview to discuss the transition of their child's cycling skills to the home environment. Of the 25 parents/children who agreed to participate in the study, nearly all agreed to a follow-up interview. It is important to note, however, that there was attrition of those who initially consented, resulting in 10 total participants interviewed at the three to six month follow up. Therefore, research question one includes data from all 25 participants and research questions two and three concentrate specifically on the 10 participants who completed a follow-up interview. The mean age for the 10 participants was 9.7 years ( $SD = 2.3$ ). Seven participants were male and the remaining three were female. The primary condition diagnosis for these 10 participants is provided in Table 1.

## **Instruments**

### **Pre-Camp Parent Survey.**

To further understand a child's progress during LTTW, a questionnaire focusing on the characterization of bike riding before camp was developed based on an existing survey (Temple et al., 2011). This instrument consisted of four questions pertaining to 1) the type of riding in the previous six months, 2) confidence in riding a two-wheeled bicycle, 3) fear and anxiety associated with riding a two-wheeled bicycle, and 4) an additional question concerning any comments regarding the child's pre-camp riding. The first three questions were categorical in nature and asked parents to indicate their responses via check box. The fourth question was open-ended, inviting parents to provide any additional information they felt was pertinent to their child's participation in the camp (see Appendix E).

Table 1

*Participant Primary Condition*

Condition	Frequency	Percentage	Participant
Attention deficit-hyperactivity disorder	1	4.0	
Autism Spectrum Disorder	6	24.0	4, 7
Autism Spectrum Disorder & Neurofibromatosis Type 1	1	4.0	6
Cerebral Palsy	3	12.0	8
Difficulty with gross motor skills	1	4.0	5
Down Syndrome	1	4.0	3
Down Syndrome, Autism	1	4.0	2
Down Syndrome, hearing condition	1	4.0	
Generalized anxiety disorder	1	4.0	
Global developmental delay	1	4.0	10
Mild developmental delay	1	4.0	
Mild or moderate intellectual disability	3	12.0	1
Nocturnal frontal lobe epilepsy	1	4.0	
Porphyrus	1	4.0	
Tourette's Syndrome, Obsessive Compulsive Disorder, Developmental Coordination Disorder	1	4.0	9

Note: Primary condition missing for one participant

### **Spotter Survey on Progression.**

Each child was assigned two volunteer spotters to assist with all aspects pertaining to riding. Spotters were consistent throughout the week, working with the same children on all five days of camp. A questionnaire focusing on the progression of cycling was developed based on an existing survey (Temple et al., 2011). This instrument consisted of six questions pertaining to 1) the type of bike the participant was riding at the commencement and conclusion of each LTTW session, 2) the degree to which the participant's own bicycle was utilized, 3) the level of handle

assistance provided, 4) participant riding speed, 5) the level of spotter intervention necessary to prevent a collision or fall, and 6) an additional open-ended question allowing spotters to comment on the participant's riding that day (e.g., emotional, psychological, and physical states). Questions one and two were categorical in nature and were formatted via check box, each box representing a differing response. Spotters were required to check the box that most accurately represented their participant. Questions three and four were visual analog scales. Spotters were required to mark their response in accordance to the percentage of time (0% - 100%) that specific actions occurred during each LTTW session. Question five required spotters to indicate how frequently they needed to take action to prevent a fall or collision on a numerical scale ranging from 0 to more than 8; and question six was open-ended (see Appendix F). As this measure was based on subjective spotter recall, inter-rater reliability tests were performed to determine the degree of agreement among spotters on the percentage of time spent holding the handle, the percentage of time the child was riding fast enough, and the number of times a spotter was required to grab the handle to prevent a fall or collision. At the conclusion of each riding session on the third day of LTTW (Wednesday), the spotter survey on progression was distributed to each spotter to complete on an individual, rather than a collective basis. Cronbach's alpha revealed strong agreement and no significant differences between these measures (see Table 2).

Table 2

*The Degree of Inter-rater Reliability on Spotter Survey Measures*

	Cronbach's Alpha	<i>p</i>
% of time holding the handle	.882	.310
% of riding fast enough	.861	.177
# of handle grabs to prevent a fall or collision	.734	.388

Pearson product moment correlations to determine the agreement of spotter estimates of time spent

riding fast enough against actual timed laps are displayed in Table 3. Results revealed a moderate negative correlation ( $r = -.60$ ) between average spotter estimates and actual timed laps suggesting that average lap time decreased as estimates of time spent riding fast enough increased.

Additionally, results reveal a moderate to high correlation ( $r = .76$ ) between spotter 1 and spotter 2 estimates of time spent riding fast enough, suggesting agreeable inter-rater reliability.

Table 3

*Agreement of Spotter Estimates of Time Spent Riding Fast Enough Against Timed Laps*

	<i>Spotter 1</i>	<i>Spotter 2</i>	<i>Time (seconds)</i>	<i>Av Spotter Scores</i>
Spotter 1	1.00			
Spotter 2	.76	1.00		
Time (seconds)	-.52	-.58	1.00	
Average Spotter scores	.92	.96	-.60	1.00

### **Self Perception Profile for Children.**

Harter's Self Perception Profile for Children (1985) is a widely utilized scale and has been applied in numerous studies involving children with a disability as participants, including children with cerebral palsy (Schuengel et al., 2006), children with developmental coordination disorder (Piek et al., 2000), and adolescents with intellectual disabilities (Ninot, et al., 2000). This measure was originally constructed for the purpose of assessing the self-perceptions and ultimately domain specific and global self-worth of children 8 years of age or older (Harter, 1985a). "The unique feature of the scale is that it uses a domain-specific approach to measure self-concept, in which children's perceptions are independently examined across four domains: scholastic competence, athletic competence, social acceptance, and global self-worth" (Renick & Harter, 1989, p. 633). Items on the Athletic Competence subscale reflect children's perceptions of their athletic ability (Renick & Harter, 1989). For each item on the scale, children are given two opposing statements.

Children are instructed to indicate if they are more like the children described on the left or more like the children described on the right side of the statement. Children then indicate whether the statement is really true or just sort of true for them. Each response receives a score between 1 (least competent) to 4 (most competent). Asking children to compare and identify the group most like them implicitly encourages the use of social comparison information in children's ratings of their perceived competence (Renick & Harter, 1989).

The current study only utilized the Athletic Competence Subscale (Harter, 1985a), which consists of questions such as the one shown in Figure 3.

Really True for me	Sort of True for me			Sort of True for me	Really True for me
<input type="checkbox"/>	<input type="checkbox"/>	Some kids do very well at all kinds of sports.	BUT	<input type="checkbox"/>	<input type="checkbox"/>
				Other kids don't feel that they are very good when it comes to sports.	

Figure 3. An item from the Self-Perception Profile for Children - Athletic Competence Subscale

Specifically, the scale consisted of eight questions of this nature pertaining to a) indoor vs. outdoor play preference, 1) perception of sport performance, 2) perception of sport skill development, 3) perception of performance at unfamiliar sports, 4) perception of sport performance in comparison to others, 5) perception of the level of involvement and participation in sport, 6) perception of performance in new outdoor activities, 7) perception of performance on a two-wheeled bicycle, and 8) perception of relative ease in riding a two-wheeled bicycle. Question seven and question eight, although constructed in a similar fashion, were additions specific to this study to examine perceived competence in relation to two-wheeled cycling and are not a part of Harter's original scale. A practice question (question 'a') preceded these eight questions and was designed to familiarize the children with the format of the scale. Question 'a' was not accounted for in

analysis. Children were instructed to think about themselves in comparison to other children with whom they are familiar and to mark the corresponding box that best describes themselves for each question, further indicating if the statement is very true or sort of true for them (see Appendix G).

### **Bike Riding Self-Efficacy Checklist.**

A questionnaire focusing on the children's perceived efficacy to cycle was developed specifically for this project. The self-efficacy questions were based on behaviours deemed to be important components of the cycling program and were developed following Bandura's (1997) recommendations for developing a questionnaire. This instrument consisted of seven questions pertaining to 1) dependence on outside assistance, 2) ability to ride in a straight line, 3) ability to use the handbrakes effectively, 4) ability to self-start, 5) ability to manoeuvre, 6) ability to ride in open environments, and 7) ability to independently don a helmet. All questions were formatted via a Likert scale ranging from 1 (disagree in a big way) to 4 (agree in a big way) (see Appendix H).

### **Semi-structured Interview.**

Guided by the ICF-CY model (WHO, 2007), parents were prompted to reflect and discuss the transformation, progression, and development (or lack thereof) of their child's participation in bicycle riding pre-LTTW, post-LTTW, and 3 months post-LTTW via individual in-depth semi-structured interviews. Parents were also asked to identify and discuss environmental contextual factors (both social and physical) that deterred or afforded their child's bicycle riding following LTTW. Specifically, interviews consisted of four questions pertaining to, 1) how the child's cycling skills had changed or how they had progressed since the end of camp and what the child had been doing in terms of cycling, 2) the things that were helpful or things that were difficult to transition cycling to home, 3) other things that could be done to assist the child to cycle or to assist the parent to help the child to cycle, and 4) what parents would change and what parents would

keep in relation to LTTW program (see Appendix I).

### **Procedures**

From July 9 to July 13, 2012, 40 children attended the LTTW camp in Victoria, BC. LTTW was hosted by the Vancouver Island Health Authority (VIHA) in conjunction with the Children's Health Foundation of Vancouver Island. Children were referred to this program directly from the occupational (OT) and physical therapists (PT) associated with QACCH. As LTTW 2012 was funded by this organization, this program was provided at a reduced cost. Adapted bicycles were also provided to parents who were unable to purchase them due to financial restrictions. During the camp itself, one OT and one PT from QACCH were present to manage behavioural matters, interact with parents, and work in conjunction with the bicycle technician from LTTW. A volunteer coordinator from the QACCH was also present to manage all matters related to the spotters. The volunteer coordinator, with assistance from the OT and PT, also distributed and collected volunteer spotter surveys on progression at the conclusion of each riding session. Two volunteer spotters were assigned to one child. Along with a bicycle technician, one other representative from LTTW was present to ensure the program operated efficiently and to assist with individual bicycle fitting and distribution. Adapted bicycles and their respective parts were delivered in a large trailer and were accessible only by the LTTW representatives.

Upon the completion of consent and assent forms by parents and children respectively, data were collected at predetermined times in accordance with the variable being measured.

The pre-camp parent survey was distributed for completion to parents on the first day of LTTW. Twenty-five parents completed this survey in the LTTW gymnasium, during their child's first riding session and submitted their completed survey by the conclusion of the session.

The spotter survey on progression (see Appendix F), a factor that aligns with the Activity component of the ICF-CY (WHO, 2007) [cycling progression] was distributed for completion to a

pair of volunteer spotters at the conclusion of each riding session on four of the five days of LTTW with the exception of the third day. On day three (Wednesday), each of the two volunteer spotters received a survey to complete on an individual basis to determine inter-rater reliability. The therapists present at the LTTW camp were responsible for the distribution and collection of all volunteer spotter surveys on progression.

Two factors that align with the Personal factors component of the ICF-CY (WHO, 2007) [perceptions of competence and self-efficacy] (see Appendix G and H respectively) were measured at three specific points in time: the first day of observations at LTTW (pre LTTW), the last day of observations at LTTW (post LTTW), and during a three to six month follow-up. Depending upon their time of arrival, children completed these surveys directly before or directly after their riding session. A research assistant from the University of Victoria assisted each child in completing the survey; some children required the research assistant to read each question out loud and physically mark their respective responses, while others independently read and answered each question after the completion of a practice question with the research assistant. All research assistants were graduate students or faculty from the department of Exercise Science, Physical and Health Education. It is important to note that one interview was received via email and therefore, only nine children completed the third round of questionnaires assessing perceptions of physical competence and self-efficacy toward riding a two-wheeled bicycle.

Personal and environmental factors were assessed at one point during a three to six month follow-up. These contextual factors were assessed using interview questions based on the constructs of the ICF-CY (WHO, 2007). Parents who agreed to participate in a follow-up interview, as indicated on the consent form, were initially contacted via email (see Appendix J). Parents who did not respond via email received a follow-up phone call. A total of nine interviews occurred face-to-face and took place at a location convenient for the participant, typically at the

participant's home but occasionally at a local café or restaurant. One interview was conducted via email. Interviews lasted 25-45 minutes and were recorded using Audacity (an open source, cross-platform software for recording sounds), downloaded onto a computer, and transcribed verbatim.

### **Data Analyses**

Question 1, what are the changes in the activity of cycling (progression), self-efficacy toward cycling, and perceptions of physical competence from pre- to post LTTW camp? The following analyses were undertaken to answer question 1: 1) Children's pre-camp cycling was characterized from the pre-camp parent questionnaire at baseline. 2) Progression during the five day long camp was documented from the spotter survey on progression (i.e. roller number at beginning and conclusion of each riding session, type of bicycle, need to hold the handle etc.). 3) Changes in self-efficacy toward riding a two-wheeled bicycle and perceptions of physical competence from pre-test to post-test (for  $n = 25$ ) were analyzed using dependent t-tests using IBM SPSS Version 19.0.

Question 2, how does participation in cycling change from pre-camp to post-camp to follow-up? This question focused on the 10 children for whom follow-up data were available. The question was addressed by comparing parental responses from the baseline questionnaire to the parent interviews. Parents were prompted to describe their children's participation in cycling (including where the child rides, with whom they ride, who initiates riding, how often they ride, the length of the rides, the purpose of riding, and the social impact of riding) from before camp to the time of the interview.

Question 3, in what ways were self-efficacy, perceptions of physical competence, the ability to cycle (activity), and the children's social and physical environment related to participation? This question was answered for the 10 children whose parents were involved in the follow-up interview; however only nine children completed the follow-up questionnaires as one

interview was conducted with the parent via email. Repeated measures ANOVAs were employed to examine changes in perceptions of physical competence and self-efficacy toward riding over time (pre-test, post-test, and follow-up). The ability to cycle was analyzed by comparing the changes in the type of bike used from descriptions in the parent questionnaire, spotter survey, and semi-structured parent interviews. In order to analyze how the children's social and physical environment contributed to participation in cycling, a qualitative exploration of parent's perceptions of barriers and facilitators was conducted via follow-up interviews. Qualitative interview data were analyzed actively and intentionally using an orientational approach (Patton, 2001). Interview transcripts were openly coded and further revisited to develop and identify categories, relationships, themes, and related critical issues. As the interview questions were formulated in accordance with the ICF-CY (WHO, 2007), the ICF-CY itself was used to juxtapose participant responses against a framework. Specifically the five environmental factors sub-sections (products and technology; natural and human made environment; support and relationships; attitudes; and services, systems and policies) were utilized and personal contextual factors were recorded as they pertained to affording or inhibiting bike riding after the camp. Themes were detected based on frequency of mention among all parents or among individual riding groups.

## CHAPTER 4

**Results**

Research question one examined the changes in the activity of cycling (progression), self-efficacy toward cycling, and perceptions of physical competence from pre to post-camp ( $n = 25$ ). Table 4 shows the characterization of the children's pre-camp bicycle riding, as indicated from pre-camp parent survey reports. As highlighted in Table 4, 56% percent of children were not riding a bike of any type before attending LTTW. Of the remaining 44%, the most common form of riding was riding with training wheels.

Table 4

*A Characterization of Children's Pre-Camp Riding by Bicycle Type*

Riding Type	Frequency	Percentage
Not riding	14	56
Riding with training wheels	3	12
Two-wheeled bike with handle	1	4
Tricycle	1	4
Stationary bike	1	4
Trail and tricycle*	1	4
Training wheels and other*	3	12
Other**	1	4

Note: \* more than one type of bike was used

Note: \*\* QACCH therapy bicycle

Table 5 shows the changes in the activity of cycling via the participant's roller progression over the course of the 5-day camp (Monday-Friday), specifically outlining the roller number, as well as the frequency and percentage of each roller. There were 8 possible rollers, roller 1 being the least difficult as it was the least tapered and 8 being the most difficult as it was the most tapered. After roller 8, children progressed to a two-wheeled bicycle either with or without a LTTW handle.

Seventy six percent of participants began on roller 3 and by the conclusion of the first session, 32% had progressed to roller 5. By the conclusion of the third riding session, just over half (52%) of participants had progressed to riding a two wheeled bicycle with a handle and by the conclusion of the fourth session, 36% of children were riding two-wheeled bicycles. A total of 96% of children were riding two-wheeled bicycles (20% with a handle) by the conclusion of the camp on day five. In addition to examining change in the activity of cycling, the impact of the camp on children's self-efficacy toward riding a two-wheeled bicycle and their perceptions of physical competence were examined. Paired t-tests revealed that children's self-efficacy toward riding increased significantly over the camp  $t(24) = -4.003, p = .001$ ; however, there was no change in perceptions of physical competence,  $t(21) = -.681, p = .503$  (see Table 6).

The second research question examined how participation in cycling changed from pre-camp to post-camp to follow-up ( $n = 10$ ). Participation in cycling is described for the 10 children whose parents participated in the follow-up interviews at three to six months (October 2012 - January 2013) following camp. [Please note. Pseudonyms and participant codes have been used to describe participants and their respective responses]. When asked to characterize their child's confidence in riding a two-wheeled bicycle before camp, the majority of the 10 parents who completed the pre-camp parent survey indicated that their child was "not confident at all" while the remainder indicated that their child was "somewhat confident" about riding their bike. Most parents also revealed that their child was fearful of riding a two-wheeled bicycle, however, responses ranged from not fearful to very fearful. Similar responses were given in regards to their child's anxiety toward riding a two-wheeled bicycle; responses ranged from not anxious to very anxious, with a large majority indicting that their child was anxious toward riding a two-wheeled bicycle.

Table 5

*Roller Progression based on Responses from the Spotter Survey*

Day	Roller #	Frequency	Percentage
Monday – Start	1	6	24.0
Monday – Start	3	19	76.0
Monday – End	1	1	4.0
Monday – End	2	3	12.0
Monday – End	3	3	12.0
Monday – End	4	10	40.0
Monday – End	5	8	32.0
Tuesday – Start	4	2	8.0
Tuesday – Start	5	16	64.0
Tuesday – Start	6	7	28.0
Tuesday – End	5	1	4.0
Tuesday – End	6	14	56.0
Tuesday – End	7	10	40.0
Wednesday – Start	5	1	4.0
Wednesday – Start	6	8	32.0
Wednesday – Start	7	13	52.0
Wednesday – Start	7	2	8.0
Missing data*			
Wednesday – End	6	2	8.0
Wednesday – End	7	9	36.0
Wednesday – End	Two wheel/handle	13	52.0
Missing data*			
Thursday – Start	7	9	36.0
Thursday – Start	8	3	12.0
Thursday – Start	Two wheel/handle	12	48.0
Thursday – Start	Two wheels	1	4.0
Thursday – End	7	2	8.0
Thursday – End	Two wheel/handle	14	56.0
Thursday – End	Two wheels	9	36.0
Friday – Start	7	2	8.0
Friday – Start	Two wheel/handle	17	68.0
Friday – Start	Two wheels	6	24.0
Friday – End	Two wheel/handle	5	20.0
Friday – End	Two wheels	19	76.0
Missing data*			

Note: \* One volunteer spotter was absent

Table 6

*Mean (SD) Perceptions of Physical Competence (n = 22) and Self-Efficacy (n=25) Scores at Pre-test and Post-test*

	Pre-test		Post-test		<i>p</i>
	Mean	SD	Mean	SD	
Perceptions of physical competence (range 8 – 32)	22.9	4.5	23.5	4.7	.503
Self-efficacy toward riding a two-wheeled bike (range 7 – 28)	16.3	5.6	21.7	4.9	.001

Overall, the pre-camp cycling experiences of these 10 children could be characterized as negative. Parents described their child’s discouragement and lack of confidence toward cycling. “He doesn’t seem to enjoy it; it is a chore for him. Would prefer not to ride a bike” (parent 9); “[Terry] gets discouraged and then does not want to practice” (parent 8); “[Karli] likes the idea of riding but hasn’t had the confidence or mapping skills to be successful” (parent 2). Some parents also described falls and concerns about falls. “Due to some accidents with riding a two-wheeled bike, he scraped his knee really bad which I feel contributes to his anxiety riding a two-wheeler” (parent 5); “[Calvin] would not try a two-wheeled bike due to difficulty getting on and fear of falling off. [He] enjoyed the trail-a-bike a lot [but] would not pedal assist on a trail-a-bike” (parent 1).

Two patterns of follow-up riding were detected based on parents’ narrative responses. These patterns are characterized as ‘riding’ and ‘not riding’. The pre-camp riding experiences of these two groups appeared to be quite similar as many parents expressed related difficulties and concerns. As indicated by ‘not riding (setback)’ in Table 7, two of the participants ‘not riding’ experienced post camp riding success until deterred by external events such as a fall. Table 7 illustrates that prior to camp, the ‘riders’ and those who were ‘not riding’ were not riding at all, riding with training wheels, or riding an alternate type of bicycle. By the conclusion of the camp, nine participants were classified as ‘riding’ and one as ‘not riding’; however, at a three to six

month follow up, five children were classified as ‘riding’, three as ‘not riding’, and two as ‘not riding due to a setback’.

Table 7

*Summary of Children’s Pre-Camp, Post-Camp, and Follow-up Riding*

Participant	Pre-Camp	Post-Camp	Follow up
1	Trail-a-bike or tricycle	Riding	Not riding (setback)
2	Not riding	Riding	Not riding
3	3-wheeled bicycle	Not riding	Not riding
4	Not riding	Riding	Riding
5	Training wheels	Riding	Riding
6	Not riding	Riding	Riding
7	Not riding	Riding	Not riding
8	Not riding	Riding	Riding
9	Training wheels	Riding	Riding
10	Two-wheeled bike with training handle	Riding	Not riding (setback)

To further characterize changes in cycling, parents were asked during the semi-structured interview, to comment on participation in cycling post-camp in terms of where the child cycles, who the child cycles with, who initiates cycling, how often the child cycles, how long the child cycles, for what purpose(s) the child cycles, and how cycling has impacted the child socially.

Table 8 summarizes these points for the ‘riders’, and Tables 9 and 10 summarize those ‘riders who experienced a setback’ and those ‘not riding’, respectively.

Table 8

*Summary of Follow-up Participation in Cycling for Children Classified as 'Riders' (n = 5)*

Participant	Where they cycle	Who they cycle with	Who initiates cycling	How often	Length of ride	Purpose of cycling	Social impact of cycling
4	Access road in backyard	Father, father in-law  (Limited help otherwise)	Parents	Initially: 4-5x per week  Now: 2x per week	20 minutes	Recreational	Limited – not as advanced as peers but can engage in discussion
5	Backyard, neighbourhood street, Galloping Goose Trail, Lockhead Trail	Father, alone (solo rides restricted to neighbourhood)  (Limited help otherwise)	Father	Now: 6-7x per week	Approximately 2 hours  (Typically 10km - furthest 14km)	Recreational	Limited – two friends with whom he seldom cycles
6	Local school grounds	Volunteers from LTTW  (No help otherwise)	Mother	Now: 1-2x per week	45-50 minutes	Recreational	Yes – relatable discussion topic/activity
8	Pearks Recreation Center, local park	Mother and/or father	Parents	Initially: 1x per week and then move	20 minutes	Recreational (attempted transportation)	No - talk of social riding but has not translated to activity
9	School track	Mother, grandparents  (uncle and cousins assisted on occasion)	Mother	Initially: everyday for 2 weeks - every second day  Now: weather issue	30-60 minutes	Recreational (physical activity)	Yes – engages in cycling with friends and family

Table 9

*Summary of Follow-up Participation in Cycling for Children Classified as Having a Setback (n=2)*

Participant	Where they cycle	Who they cycle with	Who initiates cycling	How often	Length of ride	Purpose of cycling	Social impact of cycling
1	Neighbourhood gravel road, driveway, frontage road, cul-de-sac, school grounds	Father, family members (cousins, siblings), and friends	Father	Initially: 3x per week  Now: Not riding (September end)	Attempted 30 minutes	Recreational	Yes – another activity to engage in with peers, interacting/discussing cycles with others
10	Local library grounds, BMX track	Mother, sister, husband  (no support otherwise)	Mother (but recently expressed an interest)	Initially: 2x per day  Now: not riding (August end)	20 minutes	Recreational	Yes – felt proud of cycling accomplishments and discussed cycling with family and peers (and strangers)

Table 10

*Summary of Follow-up Participation in Cycling for Children Classified as 'Non-Riders' (n=3)*

Participant	Where they cycle	Who they cycle with	Who initiates cycling	How often	Length of ride	Purpose of cycling	Social impact of cycling
2	Attempted cul-de-sac	-	Mother	-	-	-	-
3	At school (classroom, gym, hallways)	Alone, assistant	Always the adult	Rarely	-	-	-
7	Enclosed parking lot of living unit	Father  (no help otherwise)	Father (but recently expressed an interest)	3 times total	-	Recreational	Not a social outlet

As outlined in Table 8, 'riders' most commonly cycled in local areas including neighbourhoods, school grounds, and local parks. Parent 5 also reported cycling on public trails including the Galloping Goose and the Lochside Trail. Members of the immediate family most commonly assisted participants to ride at home with the exception of parent 6, who utilized volunteers from the LTTW program. Furthermore, parents most commonly initiated cycling. Cycling patterns varied for 'riders'. Some children experienced a decrease in weekly cycling as the seasons transitioned whereas others continued to ride at least a couple of times per week. Participant 5 continued to cycle with his father nearly every day of the week; however, this appeared to be an exceptional case. The average length of each ride for 'riders' was approximately 35 minutes. This average excluded participant 5, whose average riding length was 2 hours. The purpose for riding was reported as recreational from all parents whose children were in the 'riding' category. Parent 8 attempted cycling for transportation purposes, however, shortly after reverted to cycling for recreational purposes, as skill level was not developed to a necessary extent. Parents noted a limited social impact. With the exception of parent 9, social expansion was reported only in terms of a new relatable topic of conversation among peers. As outlined in Table 9, children who experienced a 'setback' most commonly cycled in local areas including neighbourhoods, home property, and library grounds. Members of the immediate family most commonly assisted children to ride, however, participant 1 also received help from extended family and friends. Like 'riders', parents of children who experienced a 'setback' most commonly initiated cycling, however, parent 10 reported that her child recently expressed an interest in cycling again. Initially, participant 1 was cycling 3 times per week, whereas participant 10 was cycling up to 2 times per day. The length of each ride was approximately 30 and 20 minutes for participant 1 and participant 10 respectively. The purpose of cycling was recreational and parents of children who experienced a

'setback' noted a prominent social impact, both in the activity and in the newfound discussions about cycling among peers. As outlined in Table 10, children who were 'not riding' most commonly attempted cycling in local areas including neighbourhoods, within the school, and parking lots. Members of the immediate family, primarily parents, both initiated and assisted children to ride, with the exception of participant 3 who cycled alone or with her assistant (on a three-wheeled bicycle). It is interesting to note that although participant 7 was 'not-riding', he had recently expressed an interest in doing so just prior to the interview. Children in this category rarely cycled; participant 2 refused to ride and participant 7 cycled a total of three times for recreational purposes. No social impact was noted.

Research question three examined the ways in which self-efficacy, perceptions of physical competence, the ability to cycle (activity), and the children's social and physical environment were related to participation. This question was answered for the 10 children whose parents were involved in the follow-up interview; however only nine children completed their follow-up questionnaires as one interview was conducted with the parent via email. Self-efficacy toward riding and perceptions of physical competence can be characterized as psychological assets of the individual, a feature encompassed by personal factors in the ICF-CY (WHO, 2007). The ICF-CY (WHO, 2007) classifies personal factors as those separate from the health condition, however, still able to play a role in disability at any level. Table 11 shows the descriptive statistics of the two dependent variables: perceptions of physical competence and self-efficacy at three measurement times (pre-camp, post-camp, and follow-up). A repeated measures ANOVA showed that self-efficacy significantly increased over time ( $F(2,7) = 7.36, p = .019$ , partial eta squared = .678) but perceptions of competence did not ( $F(2,7) = .928, p = .439$ , partial eta squared = .210). Post hoc tests for self-efficacy revealed that only T1 and T2 differed significantly ( $p = .043$ ).

Table 11

*Descriptive Statistics of Perceptions of Competence and Self-Efficacy from Pre-camp to Post-camp to Follow-up*

	n	Pre-camp	Post-camp	Follow-up
Self-Efficacy	9	$\bar{x} = 17.9^*$ $\sigma = 6.3$	$\bar{x} = 22.6^*$ $\sigma = 4.2$	$\bar{x} = 18.6$ $\sigma = 5.8$
Self Perceptions	9	$\bar{x} = 24.7$ $\sigma = 4.4$	$\bar{x} = 25.9$ $\sigma = 3.0$	$\bar{x} = 25.6$ $\sigma = 4.3$
-----				
Self-Efficacy Riders	5	$\bar{x} = 17.2$ $\sigma = 6.1$	$\bar{x} = 23.8$ $\sigma = 4.1$	$\bar{x} = 22.4$ $\sigma = 3.8$
Setbacks	2	$\bar{x} = 18.0$ $\sigma = 4.2$	$\bar{x} = 20.0$ $\sigma = 1.4$	$\bar{x} = 17.0$ $\sigma = 0.0$
Non-riders	2	$\bar{x} = 19.5$ $\sigma = 12.0$	$\bar{x} = 22.0$ $\sigma = 7.1$	$\bar{x} = 10.5$ $\sigma = 0.7$
Self Perceptions Riders	5	$\bar{x} = 25.0$ $\sigma = 4.0$	$\bar{x} = 25.4$ $\sigma = 2.1$	$\bar{x} = 26.6$ $\sigma = 3.1$
Setback	2	$\bar{x} = 24.0$ $\sigma = 1.4$	$\bar{x} = 26.0$ $\sigma = 1.4$	$\bar{x} = 19.0$ $\sigma = 0.7$
Non-riders	2	$\bar{x} = 24.5$ $\sigma = 9.2$	$\bar{x} = 27.0$ $\sigma = 7.2$	$\bar{x} = 29.0$ $\sigma = 2.8$

Note: \* Significant difference at  $p < .05$

To further explore changes in perceptions of physical competence and self-efficacy toward cycling over time (pre-test, post-test, and follow-up), group (riders, not riding, setback) comparisons were made. A factorial repeated measures ANOVA revealed that there was no effect for self-efficacy  $F(2,12) = 2.674, p = .110$ . For perceptions of physical competence, Mauchly's test indicated the assumption of sphericity had been violated ( $p = .046$ ); therefore degrees of freedom

were corrected using Huynh-Feldt estimates of sphericity ( $\epsilon = .884$ ). The results showed that perceptions did not differ significantly over time,  $F(1.8,10.4) = .796, p = .462$ .

Cycling progression was recognized as an activity, a feature defined by the performance of discrete physical tasks or actions (WHO, 2007). Tables 12, 13, and 14 show the detailed progression of each riding group over the course of the five-day camp. ‘Launch day’ represents the day in which a child has progressed to a riding a two-wheeled bicycle of any type (i.e. with a handle or without).

Table 12

*Detailed Riding Progression for ‘Riders’ (n=5)*

Participant number	Launch day	Type of bicycle launched	Notes
4	Wednesday end	LTTW with a handle	Back on roller 8 on Thursday start, however, re-launched on a LTTW bike with handle by Thursday end. Progressed to own bike with a handle by Friday end.
5	Wednesday end	LTTW without a handle	Back on LTTW bike with a handle on Thursday start. Had no further progressions
6	Thursday end	LTTW with a handle	Remained on a LTTW bike with a handle. Had no further progressions.
8	Wednesday end	LTTW with a handle	Progressed to own bike with a handle by Thursday end.
9	Thursday end	LTTW with a handle	Remained on a LTTW bike with a handle. Had no further progressions.

Table 13

*Detailed Riding Progression for 'Non-Riders' (n=3)*

Participant number	Launch day	Type of bicycle launched	Notes
2	Friday end	LTTW with a handle	Remained on a LTTW bike with a handle. Had no further progressions.
3	Friday end	LTTW with a handle	Remained on a LTTW bike with a handle. Had no further progressions.
7	Thursday end	LTTW with a handle	Progressed to a LTTW bike without a handle by Friday end.

Table 14

*Detailed Riding Progression for Those Who Experienced a 'Setback' (n=2)*

Participant number	Launch day	Type of bicycle launched	Notes
1	Thursday end	LTTW with a handle	Progressed to own bike with a handle on Friday start.
10	Thursday end	Own bike with a handle	Remained on own bike with a handle. Had no further progressions.

As shown in Tables 12, 13, and 14, the trends in cycling progressions over the five-day camp differed slightly for each riding category. On average, 'riders' initially launched onto two-wheeled bicycles earlier than 'non-riders' and those who experienced a 'setback'. The majority (3 out of 5) of 'riders' launched by the end of the third riding session whereas the majority (2 out of 3) of 'non-riders' launched by the fifth and final riding session. Both participants who experienced a 'setback' were initially launched by the end of the fourth riding session. Almost all participants regardless of riding category launched on a LTTW two-wheeled bicycle with a handle with the

exception of one ‘rider’ (participant 5), who launched on a LTTW two-wheeled bicycle without a handle and one participant who experienced a ‘setback’ (participant 10), who launched on her own bike with a handle. While no major riding “relapses” occurred, participant 4 in the riding category experienced immediate difficulty when initially launched onto a LTTW bicycle with a handle during the third riding session and was moved back down to roller 8. However, participant 4 was re-launched on a LTTW two-wheeled bicycle with a handle by the end of the fourth day of camp and experienced no further “relapses”. The only minor “relapse” otherwise detected was participant 5 in the riding category who initially launched on a LTTW two-wheeled bicycle without a handle by the conclusion of the third riding session and was accorded a LTTW two-wheeled bicycle with a handle on the beginning of the fourth riding session. No “relapses” were experienced for ‘non-riders’ (although two out of three participants in this category were launched on day five) or for participants who experienced a ‘setback’. In regards to roller progressions, participant 4 in the ‘riding’ category progressed to his own bicycle without a handle by the conclusion of the fourth riding session, and participant 8 in the ‘riding’ category progressed to his own bicycle with a handle by the conclusion of Friday’s riding session. Participant 7 in the ‘not riding’ category progressed to a LTTW two-wheeled bicycle without a handle by the conclusion of the last riding session, and participant 1 in the ‘setback’ category progressed to his own bicycle with a handle by the conclusion of the last riding session.

The results displayed in Table 15 are based on the constructs of the ICF-CY (WHO, 2007), specifically referencing the environmental and personal contextual factors, as well as body functions and structures and their relationship to participation in cycling in the home environment. Table 15 outlines the environmental factors (i.e. Products and Technology, Natural and Human Made Environment, Support and Relationships, and Services, Systems, and Policies) that posed as

facilitators or barriers in transitioning cycling to the home environment for those who were successful in maintaining or improving their riding skills at home, those who experienced a ‘setback’, and those ‘not riding’. An item received a ‘+’ if it was a facilitating factor that aided children’s cycling in the home environment and a ‘-’ if it was a barrier that hindered children’s cycling in the home environment. Items were rated based on two criteria: frequency and importance. If an item was frequently mentioned across interviews, it was considered a theme and received a rating based on its positivity or negativity. Conversely, if an item was not frequently mentioned but appeared to be a pertinent factor that highly influenced a child’s riding, it too received a rating. The following section illustrates in more detail many of the barriers and facilitating factors for cycling at home that were summarized in Table 15.

### **Products and Technology**

As shown in Table 15, under the subheading “Products and Technology”, the general design of the bikes was mentioned by the some of parents with children in the ‘rider’ and ‘not riding due to a setback’ categories as a resource that helped transfer cycling skills to home.

Extremely helpful! [...] Like she has that old-fashioned Californian bike, right? So, she doesn’t really need it [to be adjusted] because it actually just sits there, and she can put her feet on the ground and she can sit with both feet on the ground (parent 10).

Oh yeah [the design of the bike was] huge. And they are really comfortable; we all like riding his bike. We take turns riding his bike if he is having a break. Cruisers are really nice, super easy on how you sit in them and just very relaxing and comfortable. The only other modification that has been done to Cameron’s bike is that it did not come with handbrakes’, so we had handbrakes installed (parent 9).

Handbrakes are a feature recommended by LTTW and are considered an assistive feature. The majority of parents explained that the bicycles their children are now riding were modified to suit their personal specifications, however, the assistive device that was mentioned most frequently as being helpful was the handle mounted in the back of the bicycle.

Table 15

*Environmental Facilitators and Barriers to Cycling in the Home Environment*

	Riders	Not Riding (setback)	Not Riding
<b>Products and Technology</b>			
General products and technology for culture, recreation and sport	+	+	-
Assistive products and technology for culture, recreation and sport	+	+	+/-
<b>Natural and Human Environment</b>			
Physical geography, other specified	+	+	+/-
Population, other specified			-
Temperature	+/-	-	-
Precipitation	-	-	-
Seasonal variation	+/-	-	-
<b>Support and Relationships</b>			
Immediate family	+	+	+
Extended family	+	+	-
Friends	+	+	-
Acquaintances, peers, colleagues, neighbours and community members	+		
<b>Services, Systems, and Policies</b>			
General social support services, systems and policies	+/-	-	-
Education and training services, systems and policies	+/-	-	-

Parents in the ‘not riding’ category had differing experiences with such assistive products. One parent described her child’s refusal to ride despite the mounted handle while another parent asserted that the lack of a mounted handle proved to be rather unhelpful in regards to his child’s cycling progressions. For parent 7, additional or alternate modifications appeared to be needed.

“He is a little uncomfortable with the bike that we got for him and we didn’t get a chance to get it modified to suit him so we haven’t done much riding at all. [The unmodified bike] was probably about 60% [of the hindrance]” (parent 7).

## Natural and Human Made Environment

A prominent theme (theme 1) detected for successful riding at home for ‘riders’ and those who experienced a ‘setback’ was having access to suitable cycling environments. It appeared that physical geographical characteristics such as close proximity, flat, level surfaces, open space, minimal traffic, and in one instance, a softer surface to cushion potential falls were facilitators to successful riding at home. Parent 4 stated the following in regards to the accessibility of her child’s riding environment,

[Todd cycles] on the access road in our backyard. It’s close to home. There is very little traffic - it’s flat, there is only a one-way traffic and it’s only the people that live on that road, so we can just grab the bikes from the shed, go down to the steps in the backyard and he only goes up and down the road. Otherwise, we have to load the bike in the van and drive somewhere [...]. Basically the access road is the best (parent 4).

The majority of parents in the ‘not riding’ category commented similarly in regards to the physical environment and did not find this particular factor to be a hindrance to successful riding. One parent, however, did find the lack of accessible cycling environments to be a noteworthy factor that deterred further cycling: “The other 40% [of his unsuccessful riding] was the environment, the physical environment, the other people in the environment, and the other users like the cars. [...] The environment itself isn’t completely ideal” (parent 7). A noteworthy theme (theme 2) detected in all riding categories was the deterrence of weather related factors such as temperature, precipitation, and seasonal variation. Namely, that a change of seasons and the associated weather conditions would be problematic in regards to their child’s cycling progressions at home. When asked about the weather as a potential hindrance, parents in all riding categories provided the following responses: “Absolutely, the wind doesn’t work too well for him cause he’s still not stable enough and no one likes to cycling in the rain [...]” (parent 1). Another parent stated the following in regards to weather as a barrier,

Cameron is just starting to be able to start the bike on his own, like, before I'd have to hold the handle – and I would give them just that little bit and he's off but he's still on the track though, I haven't transferred because we ran out of time with the weather and it getting dark right, because he's at school until 3 and then by the time he gets home... so we couldn't do that (parent 9).

### **Support and Relationships**

Continued immediate family support and involvement was a theme (theme 3) discussed by all parents in regards to their child's continued success in cycling. As shown in Table 15, riders of all classifications were given tangible, informational, and/or emotional support by their parents and in few cases by extended family members. Tangible support can be defined as the provision of financial assistance, material goods, or services (Langford, Bowsher, Malonley, & Lillis, 1997); informational support is the provision of knowledge one can use to resolve a problem (Krause, 1986); and emotional support as empathy, caring, love, and trust (Krause, 1986). In almost all cases, parents both initiated cycling and physically aided their child in cycling. Parents of all riding categories provided the following responses when asked about the potential progression of their child's cycling had they not been involved to the degree that they were: "I don't think he would have been cycling at all at this point. Left to his own devices he'd be stuck on the computer" (parent 7).

Well it would have fallen off, I mean, he would have lost that skill. The big thing for him or any child with special needs [who] is having difficulty with something is [...] to master that skill [...] and then maintain it. Then to maintain it, you [need] some consistency after and if he hadn't had done it for a long time, he would have eventually lost that skill (parent 4).

[My parents] were really helpful because they would come out to the track [...]. I think that was hugely successful - if I had just gone home and we had only done it every once in a while, I don't think that he would be at the stage that he is at (parent 9).

Parent 6, whose child was in the riding category, sought assistance from two volunteers she had met at the LTTW program. She commented on the unlikely progression of her son's cycling skills

had the volunteers not been available to provide such assistance. This highlights the importance of acquaintances, peers, colleagues, neighbours, and community members for this particular parent. Help from extended family, friends, and acquaintances was rarely mentioned by respondents but did prove to be quite beneficial for those who had access to such assistance. As two parents commented:

I think it was helpful, the whole kind of family involvement, the consistency of going every night or every second night. I think that those were key; I think if we hadn't done that he probably would still maybe be at the starting stages or would have lost interest in it (parent 9).

We had friends, we had family, we had relatives, cousins, siblings, everyone was out. And actually they all took a go at his bike too so that was quite the... [...] He is a very social guy and having all those other people cheer him on is a huge positive for him (parent 1).

While parent 9, whose child was in the riding category, noted a prominent social impact, the majority of parents commented on the limited changes seen in regards to social growth and extended social opportunities (theme 4): "I wouldn't say [it is a social outlet] I heard [Ryan's] dad say something about "now they can ride bikes together" but nothing has really happened with that" (parent 8).

No [social impact], because he is not cycling with people. He is not up to the level of his peers and we can't let him take his bike and just go and his peers do [but] yeah he knows his bike, he would talk to his friends about biking [...] (parent 4).

All parents in the 'not riding due to a setback' category commented on the social benefits their children experienced as a result of successful riding. Parent 1 even commented on his child's involvement in other social activities as a result of his riding success:

I think it's added definitely another thing that he can do with them. This summer we also added more skills like we went on an inner tube behind a boat and different things like that. And when you see him interact with others, he's rather than just talking about "hey nice shirt", he's talking about, "I was riding a bike, or I was on an inner tube or I was doing this or that" or "my bike is like this and I see your bike is like that [...]". All kids seems to ride bikes and now he can talk about a bike as well and kind of relate to that (parent 1).

I think she felt accomplished so she had something to talk about, too. “Oh have you seen my bike?” Like everyone at the park “this is my bike and I’m riding!” It was really a big deal actually and it made a huge difference because she could show her bike off, she has something to talk about, and she was really proud (parent 10).

### **Services, Systems, and Policies**

A prominent theme (theme 5) across all riding categories was the lack of services, systems, and policies available in the home environment to assist with further riding. A few parents of the children in the riding category did not seek additional services, as they were confident with their child’s new riding abilities. A select few commented on the maintenance assistance from local bicycle shops but there were otherwise mixed responses from parents in the riding category: “If there were more services I would take him there to practice more bike riding” (parent 6).

[...] We discovered the re-cyclists on the Galloping Goose. It’s a co-op so they have all kinds of different workshops on there so that’s something I’d like to get more involved in with Eric [...] Oh like how to tune your own bike which is fantastic. There is a nominal fee and they basically tell you how to do it. [...] For Eric I think it would be a really good opportunity (parent 5).

He attended Pedal Heads bike camp the following week. It was awful! He actually stopped riding a bike and refused to bike and we ended up not completing the whole week because of it. It was unsuccessful because he didn’t know what was expected of him and the way that they did the camp was different each day, plus, they did most of the bike riding on the grass so being on uneven ground with a little bit of a sloped hill was very challenging for him so his confidence was completely busted (parent 4).

Parent 7, whose child was in the “not riding” category, directly commented on the hindrance experienced as a result of the lack of available services. When asked to provide recommendations to municipal councils or recreation planners to ease the transition of cycling to the home environment, a common suggestion among all parents was the need for indoor riding facilities. As some parents commented: “Oh yeah I think, you know, if it’s possible to open some sort aspect of a recreational facility or low impact bicycling indoors, that would be really ideal” (parent 7).

Parent 9 also commented, “[...] That would be good, especially because it gets dark so early now.

[...] If there was an indoor track that kids could practice going around then that would be really good”.

Alternately, parents suggested cycling programs or classes for children of all abilities, creating more available outdoor space such as bike paths, paved routes, and cycling parks, and developing cycling areas outdoors that are more conducive for beginner cyclists. Parent 1 suggested creating areas with lined paths and stop signs painted on the ground to assist beginnings in navigating and steering while parent 8 commented that widely used and available cycling trails such as the Galloping Goose are overcrowded and perhaps need to be widened to accommodate beginner riders.

The following section will outline and review aspects of the LTTW program itself, specifically, the facilitating factors and barriers to cycling experienced while attending this service.

### **Facilitators to Cycling Experienced in the LTTW Program.**

Overall, all parents were very pleased with the LTTW program and would highly recommend it to others. Parents complimented various aspects of the program including, a) the social opportunities provided, b) the positivity of the environment and the consistent positive reinforcement, c) the likeability and effectiveness of the volunteers and staff, and d) the specific techniques used to steadily and continuously progress their child to the next riding level. The following quotes support each of the previously listed points respectively:

a) There was another little boy, Jason, in the group that he quite enjoyed. They were giving each other high fives and they kind of both fed off of each other [...] they were a little bit competitive with one another and then they became a little bit competitive with the group [...] (parent 4).

b) The consistent positive reinforcement that the program offered, there didn't seem to be any kind of “oh you did this wrong”, it was more re-directing “let's try it this way” or something, that's what I perceived but you were there for more days than I was there (parent 8).

c) I think the program is great. I think everything about what they did during that time was fantastic. They were very easy going, low key, encouraging - the volunteers that they had who came in were very supportive [...] What I saw with LTTW was the staff and the volunteers that were involved; I think that they were key with most of the success with the kids (parent 9).

d) I think the fact that they changed it up everyday was a positive. Like, the first day you are doing the roller thing, the second day you are doing the tandem bike, like the variety, I think kept him interested (parent 8).

LTTW also provided parents with various tips and techniques, whether directly or indirectly, to instill a confidence in teaching their children in the home environment. Tips and techniques mentioned included, consistency, positive encouragement, effective riding environments, and how they physically assisted children while riding. For example, gently tapping the mounted handle as opposed to grabbing it in order to correct faulty movements as mentioned by parent 4. These factors facilitated successful riding for parents with children in all riding categories.

### **Barriers to Cycling Experienced in the LTTW Program.**

As parents were delighted with the program, there were very few barriers that parents experienced in regards to the format or the structure of LTTW. A prominent theme (theme 6) mentioned by almost all parents, regardless of whether their child was riding independently at follow-up or not, was extending the length of the program, namely, a week extension to solidify their child's cycling skills. Regarding this recommendation, one parent commented:

[...] I would highly recommend making it two weeks. Just seemed like the kids got used to it, got outside and then were released to the home environment [...] I think you would see a higher success with kids enjoying biking and sticking with it afterwards because their skills would have been honed a little bit more and they would be more comfortable with it" (parent 9).

Other parents suggested alternate extensions in the form of regular weekly programming.

Because I thought the program was so fantastic that it would be nice to kind of have a stage two of LTTW, like "continue your growth" you know? [...] You could definitely make a program of it and I think a lot of kids would go back to it, like if there was a weekly class [...] (parent 9).

Another fairly common suggestion mentioned by parents with children in the ‘not riding’ and ‘not riding due to a setback’ categories was additional guidance in learning how to teach their children to ride:

It would be really awesome if they could make the program longer so they’d had more time on the two-wheeled bicycles plus maybe some feedback like some input for the parents about negotiating things about obstacles in environments and stuff like that because I found that my own bicycling skills don’t translate well to instruction... really, which has been a real stumbling block. [More assistance with parents on how to teach] would be really, really super (parent 7).

Other suggestions from parents in all riding categories included, temporarily renting out the LTTW handles, extending the program to children of all abilities, having the opportunity to meet with the volunteers beforehand to discuss specific needs, and improving the sustainability of the program as to increase it’s availability. Parents of all riding categories also commented on the use of a volunteer in the home environment had it been available. When asked about utilizing a volunteer service, parents said the following:

[...] That sounds quite good actually. [...] It’d be a different voice telling him the information we keep telling him, I think like Charlie was saying, hearing it from someone else and also maybe, they would have different perspectives that we haven’t seen (parent 8)

A few parents from both the ‘riding’ and ‘not riding’ category communicated the desire for ongoing support in alternate forms, namely the formation of parental support groups, follow-up visits, collective ongoing riding sessions, or more guidance on the next steps.

[...] I think there should be perhaps some sort of ongoing mechanism for feedback or questions for people who have graduated it, I think would be very useful. [...] I don’t really know how I could describe that, yeah, something, online community I don’t know, something. Yeah a forum or something [to connect parents in the program or LTTW coordinators to generally offer tips or otherwise assist], that would be really useful (parent 7).

It might be beneficial for them, at the time, when they are finishing off the group is to get the parents to connect with each other or even better form an after support group where you can go and meet as parents at a specific location and carry on with the kids and the parents

getting together so there might be in cases, where a parent can't run after the bike, another parent like myself could spell them off and run after so you have kind of an after group that gets together and supports each other and then it might encourage the kids to keep going. Plus the kids themselves might encourage it and they are having people riding with them and keeping up the social-ness of it and I mean, that's easy enough for them to do instead of maybe running the program longer, they just come up with an after support group that is formed by the parents so you can go at this time, on these days, at this location and everyone can kind of meet (parent 9).

Overall, parents in all riding categories found the application progress straightforward and simple, however, a few parents commented on the seeming secrecy of the program and recommended that it be generally more accessible and more publicized in the media:

No, I thought that was fine. I would keep it pretty much as it is; ideally if there was more funding then the program could be more accessible would be the only thing [...] (parent 7).

There wasn't a lot of, like not media, but it was kind of a really good secret – not a lot of people knew about it or I'd never heard about it but I think it'd be good for them if there was more public awareness [...] Kids with any disabilities, it should be like in the pamphlet [...] Like the learning disabilities of BC or whatever there is all those different associations to have that advertised [...] (parent 8).

Using the ICF-CY as a guide, the following tables (Table 16 & Table 17) provide a summary of the environmental facilitating factors and barriers experienced by parents with children in all riding categories.

Table 16

*A Summary of the Environmental Factors that Facilitated Cycling in the Home Environment*

<b>ICF-CY</b>	<b>Facilitators</b>
Products and Technology	Modified LTTW bicycles; mounted handles
Natural and Human Made Environment	Safe, accessible environment/areas to ride
Support and Relationships	Continued family support and involvement
Services, systems, policies	LTTW program; QA (connecting with program)

Table 17

*A Summary of the Environmental Factors that Created Barriers to Cycling in the Home Environment*

<b>ICF-CY</b>	<b>Barriers</b>
Products and Technology	Unmodified bicycles
Natural and Human Made Environment	Inaccessible environment/areas to ride
Support and Relationships	Parents unable to help their child
Services, systems, policies	Extension of the program, a guide or plan, follow-up support groups

### **Children's Personal Factors**

To reiterate, personal factors are recognized by the ICF-CY as contextual features of the individual that are not part of the health condition or state (WHO, 2007). A common personal trait that arose among the 'riders' is confidence. The majority of parents noted a newfound confidence or a lack of hesitation toward cycling in the home environment. As parent 5 commented, "[...] Now that he has the confidence to ride on his bike you know, now he's able to do other things. Like we're trying to get him standing up and pushing" (parent 5). Parent 9 noted a newfound excitement and positivity in her child toward cycling. Parent 8 noted the frustration that her child typically experiences when success at any activity, particularly cycling, is not immediate but now sees the positive experience bicycling has become as a result of LTTW. Parents in the 'not riding due to a setback' category commented on how the personal traits of their children either helped or deterred their riding. Specifically, parent 1 explained that his child is "wishy-washy" toward riding because of his dislike toward change in general. Parent 1 commented that, "once you get him outside, he doesn't want to go inside" and thus, he has to be in the right mood to reciprocate parent 1's excitement toward riding. Parent 10 described her child's tendency to become distracted and lose focus toward cycling.

As parent 10 describes,

[...] some days she could ride well but other days she wasn't riding as well, like, she just couldn't focus enough. So for her I think she has the skill, it's just the focus [...] she loses focus; she wants the social (parent 10).

Parents in the 'not riding' category noted personal attributes similar to those reported before camp.

Many parents noted a particular fear, hesitation, or lack of security when attempting to cycle in the home environment. As parent 3 commented, "The main barrier we have faced is that Ashley is cautious to the extreme and her fear of falling and of the unknown inhibits her progress". Parent 2 also commented, "In that environment I think her confidence was up but when we came home it was just too big, she's not ready, one more year and she might be ready".

We actually got him out and on the bicycle a grand total of three times and that was, twice in the first week and then tried again, uhh took a week off cause he was really hesitant about it and at that point the whole momentum was lost (parent 7).

### **Body Functions and Structures.**

Body functions and structures, a component of the ICF-CY, was not a key factor to riding in any of the riding categories. A few parents had mentioned balance, coordination, and stamina difficulties but these did not appear to be a key hindrance to riding in the home environment:

Once he gets started he is quite well balanced I've noticed which is a big change for him, balance was always a challenge for him and more control over steering and the breaks, sometimes he'd get a little frustrated... [...] He is still quite a bit all over the place though [...] (parent 8).

It depends on the day, some days he's lazy. And his stamina isn't as good [as it is during] the first 5 minutes; he needs [support] quite a bit less then the last 5 minutes. [...] But I would push just to keep working on the balance and build some stamina (parent 1).

## CHAPTER 5

### Discussion

A majority of children with disabilities do not meet recommended physical activity levels (Frey et al. 2008; Longmuir & Bar-Or, 2000; Majnemer et al., 2008; Rimmer & Rowland, 2008; Steele et al., 1996) due to limited opportunities and numerous barriers. Although bicycle riding offers a popular source of physical activity, many children with disabilities do not acquire the skills to ride a two-wheeled bicycle (Klein et al., 2005). The aim of this study was to understand participation in bicycling in children with disabling conditions by tracking participants before, during, and after the Lose the Training Wheels (LTTW) program. Progress during the camp as well as barriers and facilitators for cycling at home were examined. This was accomplished through utilizing the ICF-CY as a framework to explore interactions between the rider's self-efficacy toward cycling and their perceptions of physical competence, their emerging bike riding skills, and factors in the home environment that facilitated or hindered participation.

The first research question examined the changes in the activity of cycling (progression), self-efficacy toward cycling, and perceptions of physical competence from pre to post camp of 25 children. Cycling was firstly characterized by pre-camp measures. Results showed that none of the children were successfully riding a two-wheeled bicycle prior to camp, with 56% not riding a bike of any type before attending LTTW. Cycling progression was tracked over the course of the five-day camp and it was revealed that a total of 96% of children were riding two wheeled bicycles (20% with a handle) by the conclusion of the camp. Similar rates of cycling success were reported among other studies that examined the LTTW program. Burt, Porretta, and Klein (2007) found that all seven children in their sample were able to ride a two-wheeled bike for 12 meters by the end of camp. Similarly, MacDonald et al. (2012), reported that 73% of children with Down syndrome and 85% with ASD successfully demonstrated the ability to ride the bicycle by the

conclusion of the five-day camp. An additional study by Ulrich et al., (2011), indicated that 56% of children in their sample learned to ride a two-wheeled bicycle during the five-day intervention. Although the percentage of children who were riding independently by the conclusion of LTTW is higher in the current study, taken together, these suggest that the current format and delivery of LTTW is effective in teaching children to successfully ride a two-wheeled bicycle in the allotted timeframe. This high percentage of successful riders in the current study is curious and somewhat difficult to explain. Eight of the children were diagnosed with autism, as a primary condition or in conjunction with another condition, and three of the children were diagnosed with Down syndrome. This suggests that it is not the condition of the children that accounts for the disparity in successful riding between these studies. Perhaps the affiliation with the local partner, Queen Alexandra Centre for Children's Health, may explain the higher percentage of 'riders' in the current study. Therapists associated with QACCH referred children who would seemingly benefit from the LTTW program. Furthermore, as two therapists (one OT and one PT) from the centre were present for the duration of the camp, participants benefitted from individualized supports, adaptations, and assistance where needed. It is also feasible that the extent of the participants' limitations were lower in this sample.

The impact of the camp on children's self-efficacy toward riding a two-wheeled bicycle and their perceptions of physical competence were also examined. Results revealed that children's self-efficacy toward riding increased significantly from pre to post camp; however, there was no change in perceptions of physical competence. To date, self-efficacy and perceptions of physical competence have not been explored as components of the LTTW program, however, a study by Mazzoni et al. (2009) examined a 6-week indoor rock-climbing program on perceptions of self for children with special needs. Findings demonstrated that conditions were insufficient to change

perceptions of physical competence (Mazzoni et al., 2009). The authors suggested that it may take multiple performance successes across a extensive variety of performance contexts to change perceptions of the physical self because children with disabilities have experienced a lifetime of lack of success in physical activities. In the current study, however, the unrealistic baseline scores may explain the lack of change in children's perceptions of physical competence. This finding is of interest as children with disabilities, particularly those with poorer motor skills (Piek et al., 2000), have been shown to have lower perceptions of their physical competence (Piek et al., 2000; Renick & Harter, 1989). Thus, an improvement in cycling skills and in most cases, the ability to successfully ride a two-wheeled bicycle, did not significantly change perceptions of physical competence. The lack of change in perceptions of physical competence may be related to the basis of comparison. Who the children compare themselves to may influence their self-perceptions. A study by Renick and Harter (1989) showed that students with a learning disability revealed lower self-perceptions for each of the scholastic competence scores than for their perceived social acceptance, physical competence, and global self-worth. Eighty-four percent of the students with a learning disability spontaneously compared themselves with their regular classroom peers. Thus, in social comparison research, it is important to identify the possible reference groups (Renick & Harter, 1989). It is possible that children in the current study may have been comparing themselves to a population in which they felt superior or at the very least, on par. Alternatively, a study by Carroll and Loumidis (2001), found that participation in physical activity was significantly higher for children with high-perceived competence compared to those with low-perceived competence. As children generally chose to engage in activities that they perceived themselves competent (Bell, 1997), it is possible that children in this sample engaged in adequate levels of physical activity. While contrary to the literature, if the children were frequently participating in physical activity,

baseline perceptions of physical competence would indeed be high. Alternatively, according to Harter (2012) self-representations at early to middle childhood are “typically very positive, and the child continues to overestimate his/her abilities” (Harter, 2012, p. 55). While early to middle childhood represents children aged 5 to 7 years, it is possible that the cognitive capacity of the participants is comparable to that of younger children. If the participants in the current study are indeed functioning at this level, they will likely have inflated perceptions of the self. Lastly, the majority of participants completed the initial self-efficacy and perceptions of physical competence questionnaires at the conclusion of their first riding session. As children had preceding negative experiences with two-wheeled cycling, initial exposure to successful riding may have instilled a belief that they could perform successfully in other physical activities that they had previously struggled with.

Research question two examined how participation in cycling changed from pre-camp to post-camp to follow-up for 10 LTTW participants. The majority of the 10 parents who completed the pre-camp survey indicated that their child was “not confident at all” about riding their bike. Most parents also revealed that their child was fearful toward riding a two-wheeled bicycle and similar responses were given in regards to their child’s anxiety toward riding a two-wheeled bicycle. Overall, pre-camp experiences appeared to be very similar and could be characterized as negative. This finding echoes Temple et al. (2011), who indicated that parents of 11 children participating in a LTTW bicycle camp characterized their children’s pre-camp experiences as negative, frustrating, scary, and in some instances hazardous. In the current study, two patterns of post-camp riding were detected based on parents’ follow-up narrative responses. These patterns were characterized as ‘riding’ and ‘not riding’. By the conclusion of the camp, nine participants were classified as ‘riding’ and one as ‘not riding’; however, at a three to six month follow up, five

children were classified as ‘riding’, three as ‘not riding’, and two as ‘not riding due to a setback’. These characterizations are similar to those indicated by Temple et al. (2011), who found two distinct patterns of participation: ‘rider’ and ‘not there yet’. The current study expands on these characterizations with the addition of a ‘not riding’ subdivision: ‘not riding due to a setback’. The participants who experienced a ‘setback’ were deterred from cycling based on external events; participant 1 underwent surgery, unrelated to his condition, that left him temporarily unable to ride and participant 10 experienced a fall which resulted in a concussion and an ultimate cessation of cycling due to parental and child fears. It is also of importance to indicate that the parent of participant 3 in the ‘not riding’ category established riding goals inconsistent with the goals that the LTTW has for their participants; the goal for participant 3, as outlined by her parent, was to successfully ride her three-wheeled bicycle in the community, in low traffic areas, while accompanied by an adult.

Similarities in riding participation were detected across riding groups in regards to cycling location, who they cycle with, who initiates cycling, and the purpose of cycling. ‘Riders’, ‘non-riders’, and those who experienced a ‘setback’ all cycled in local areas with a member or members of the immediate family (primarily parents). Parents also initiated cycling and the purpose for cycling was recreational. How often the children cycled, the length of each ride, and the extent of the social impact differed both within groups and between groups. While there were several similarities detected, participant 5 (‘riding’) and participant 2 (‘not-riding’) presented as extreme cases in their respective riding categories.

Research question three examined the ways in which self-efficacy, perceptions of physical competence, the ability to cycle (activity), and the children’s social and physical environment were related to participation in cycling. This research question is about what happened when the

children attempted cycling at home. This was the first study to examine self-efficacy toward cycling and perceptions of physical competence as components of LTTW and it was found that neither of these features differed significantly between riding groups at follow-up. Self-efficacy, did, however, decrease from post-camp to follow-up in all riding groups; the ‘riding’ group experienced the smallest decrease in self-efficacy during this timeframe while the ‘non-riders’ experienced the biggest decrease. The small number of participants in each riding group did not allow for a high level of power to be attained, explaining the lack of significance between riding groups at follow-up. It is likely that the decreases in self-efficacy occurred because the home environment was less controlled than the LTTW camp. Parent 2’s comment, “In that environment I think her confidence was up but when we came home it was just too big, she’s not ready [...]” is indicative of how the lack of control and security in the home environment effected self-efficacy toward riding a two-wheeled bicycle.

When examining the contribution of the social and physical environment to riding, six themes were detected. A prominent theme (theme 1) detected for successful riding at home for ‘riders’ and those who experienced a ‘setback’ was having access to suitable cycling environments. Physical characteristics such as close proximity, flat, level surfaces, open space, and minimal traffic contributed to cycling in the home environment. Similar findings have been reported by Panter et al. (2010), and Chang and Chang (2008), who found that cycling to school was positively associated with particular physical environmental features including perceptions of low/safe traffic (Chang & Chang, 2008; Panter et al., 2010). In contrast to Panter et al. and Chang and Chang, the participants in this study were cycling for recreational purposes as opposed to transportation purposes. A noteworthy theme (theme 2) detected in all riding categories was the deterrence of weather related factors such as temperature, precipitation, and seasonal variation.

Similar findings have been reported by Chang and Chang, who found that appropriate lighting and weather conditions were factors conducive to cycling. An additional study by Cervero and Duncan (2003) revealed that various exogenous factors, such as topography, darkness, and rainfall had far stronger influences on cycling behaviour than features such as mixed land use or street-connectedness. Parent 9 had commented specifically on her inability to transfer her child off the track on which he was cycling due to weather and earlier darkness as autumn neared. As suggested by parents, it would perhaps be beneficial if LTTW launched late June or perhaps earlier in July to allow more time for skill development in the home environment. Continued immediate family support and involvement was a theme (theme 3) discussed by all parents in regards to their child's continued success in cycling. This finding was also reported by Temple et al. (2011) who found that continued family involvement was a factor that facilitated cycling for both 'riders' and 'those not there yet' (i.e. 'non-riders'). King et al. (2003) also concurred that participation was influenced by the supportiveness of the home environment. This study differed in that it focused on participation in a distinct activity. Furthermore, Allison (1996) reported that the presence of family members with whom to engage in the activity, promoted participation for children with disabilities. Thus, children in all riding categories appeared to have sufficient family support and involvement. Klein et al. (2005) posited that the bicycle affords recreational opportunities with both family and peers. While families were involved, limited social impact among peers was a theme (theme 4) detected in all riding categories. The only exception was detected among parents with children in the not 'riding due to a setback' category, who commented on the social benefits their children experienced as a result of successful riding. It is rather curious as to why social opportunities did not expand for riders. MacDonald et al. (2011) reported that an age appropriate motor skill and activity such as two-wheeled bicycling supported opportunities for children to

practice basic social skills. While bicycling is perhaps an age appropriate activity, children in the current study may not have developed their cycling skills significantly enough to equal the level of their peers. Parent 4, who noted that her child was not able to cycle with his peers, as he has not yet reached their skill level, supports this premise. Parents with children in the ‘not riding due to a setback’ category noted that while their children may not be physically riding with peers, opportunities for socialization heightened as bicycling is a topic of conversation that they can now relate with and contribute to. Parent 10 explicitly commented on the newfound pride her child experienced as a result of successful riding and the opportunities gained to show off her new bicycle, which instilled a sense of accomplishment. MacDonald et al. (2011) found that two-wheeled cycling assisted in the practice of daily social situations and enhanced peer and family relationships among youth with ASD. Similar to the experiences of parent 10, Macdonald et al. found that youths in their study “generalized social skills based on their abilities to ride two-wheeled bicycles; these skills included independence, confidence, positive emotions and successful coping strategies” (p. 41). A prominent theme (theme 5) across all riding categories was the lack of services, systems, and policies available in the home environment to assist with further riding. The services that were discovered and utilized by parents were predominantly concerned with bicycle maintenance as opposed to teaching methodologies or tangible riding assistance. Parent 4, however, discovered an alternate bicycle camp to promote further cycling skill development. As teaching methodologies differed significantly from those demonstrated in LTTW, her child’s cycling skills reverted and in fact worsened, resulting in the same fear, hesitation and doubt demonstrated pre-LTTW. This finding suggests that the type of assistance provided is important to promote continued success in cycling. Murphy and Carbone (2008) suggested that participation in physical activities is less accessible to children with disabilities.

Aside from the occasional *special* recreation programme offered in a small number of communities, most children with disabilities are not afforded the same opportunities to participate in physical activities as their non-disabled peers (Kasser & Lytle, 2006). This is because many physical, programmatic, and attitudinal restrictions create barriers to participation for children with disabilities (Murphy & Carbone, 2008). LTTW was tailored to meet the needs of children with disabilities; however, it appears to be exceptional in this regard. Lastly, while all parents were pleased with the LTTW program and would highly recommend it to others, a prominent theme (theme 6) mentioned across all riding categories was the need for a program extension to solidify their child's cycling skills. As LTTW was considered a service in the current study, a program extension would also address the concerns expressed in theme 5. Similar findings were also reported by Temple et al. (2011), who found that more days, an extension of the program, a guide or plan was needed in order to facilitate children's cycling post-camp.

Overall, 'riders' had available all the features they needed to engage in successful riding in the home environment. Appropriate equipment, accessible environments, and continued family support afforded them the opportunity to continue riding. The lack of services did not appear to be a deterrent to riding for children in this category. These features also appeared to be available for children who experienced a 'setback' as they were riding successfully until deterred by an external event. Those who were 'not riding' appeared to have access to many of the supports that 'riders' and those who experienced a 'setback' had. Parent 7, however, whose child was in the 'non-riding' category noted the lack of riding success his child experienced in the home environment due to inaccessible riding environments and a lack of appropriate bicycle modifications. Thus, with the exception of participant 7, as children in all riding categories appeared to have appropriate equipment, accessible environments, and sufficient family support and involvement, it is unlikely

that these factors significantly contributed to unsuccessful riding in the home environment. Furthermore, the lack of significance in self-efficacy toward riding and perceptions of physical competence between riding groups at follow-up can be explained by the low sample power, and likely contributed to unsuccessful riding in the home environment. A prominent similarity noted among the ‘not-riding’ category, however, was the re-emergence of the personal attributes experienced before camp. Parents with children in the ‘not-riding’ category noted a particular fear, hesitation, or lack of security when attempting to cycle in the home environment (consistent with the decrease in self-efficacy at follow-up) whereas a common personal trait that arose among the ‘riders’ was confidence. Confidence, or a lack thereof, did not appear to significantly deter those who experienced a ‘setback’ as parents did not identify these children as being necessarily confident or necessarily hesitant. Therefore, the confidence, fear, and/or hesitation toward cycling emerged as a significant influence and appeared to separate those who were ‘riding’ from those who were not. As parent 2, whose child was in the ‘not-riding’ category stated in regards to her child’s riding at home,

Yeah, scared, not going. [LTTW] was such a nice contained environment [...] It’s just the build up, I think that is what makes the program so unique is the build up of having two people beside you and in front of you. It’s the build up of feeling safe and everything that made her feel safe wasn’t there [anymore].

Therefore, it appeared that while the lack of available services did not significantly impact the ‘riders’, ‘non-riders’ did not receive the support needed to transfer successful riding to the home environment leading to the re-emergence of fear and hesitation. Body functions and structures were not a key component to riding in any of the riding categories.

## **Limitations**

There are a number of limitations to this study that should be noted. First, as 10 participants out of a potential 25 took part in the follow-up interview, the participants interviewed may not be representative of the participants as a whole. A series of independent t-tests measuring age, gender, and whether the child was repeating the LTTW camp determined that there were no significant differences between the interview participants and non-participants ( $p = .988$ ,  $p = .138$ ,  $p = .061$ , respectively) suggesting that the 10 interview participants did not differ significantly from the larger sample. Second, as previously addressed, the limited ability of children with a cognitive impairment to accurately respond to survey questions was also a concern. Having alternate methods or assistive devices to aid these children in responding may have proved beneficial (i.e. visual cues to represent ‘very’ and ‘sort of’). Third, participants with extreme scores may have skewed the group mean, especially when considering the limited number of participants in each riding group. Fourth, children’s’ fear and anxiety towards two-wheeled cycling were only assessed pre-camp. It would have been beneficial to explicitly inquire about these measures post-camp and at the three to six month follow-up to gain a better understanding of how personal factors contributed to overall riding patterns. Fifth, a more extensive inquiry about elements related to perceptions of physical competence was needed. As expressed previously there was a lack of comparison specifications within the Self Perception Profile for Children. As children’s’ perceptions of the self may differ depending on the source of comparison (Renick & Harter, 1989), it would have been beneficial to examine this more closely to determine which population these children are more compelled to compare themselves to and how differing comparisons influence perceptions of the physical self. Furthermore, as baseline perceptions of physical competence may be high if children were frequently participating in physical activity, inquiring about children’s’ pre-camp physical activity levels may have provided more insight into

their high physical perceptions. Sixth, a component of the ICF-CY that was not addressed explicitly in the post-camp interviews was attitudes. Thus, it is not possible to say for certain what parental attitudes as well as the attitudes of extended family, friends, or otherwise unspecified were toward their child's bicycle riding. On the basis that families did enrol their children in the LTTW program and continued their efforts to promote successful riding post-camp, we assume that their attitudes toward their child's cycling were positive.

### **Strengths**

Despite the limitations, this study also had many strengths. One strength was its novelty. While previous works have examined aspects of the LTTW (Burt, Porretta, & Klein, 2007; MacDonald et al., 2012; Temple et al., 2011; Ulrich et al., 2011), this is the first study to investigate how children's bike riding progressed over the course of the five day camp, and the impact that the children's cycling skills had on their self-efficacy toward riding a two-wheeled bicycle and their perceptions of physical competence. Another strength of this study is the direct involvement with a community organization and the potential to use the findings to develop and implement interventions to support parents and children in ongoing successful riding at the conclusion of the program. The number of participants involved in the pre-camp and post-camp measures is another strength of this study. As 62.5% of children enrolled in LTTW agreed to participate in the study, it is likely that this sample is representative of the larger population. Further methodological strengths were noted in the methods. For instance, all surveys were distributed by research assistants from the University of Victoria, better ensuring that the participants understood the questions and affording the opportunity to observe how the participants were responding. Furthermore, efforts were made to ensure inter-rater reliability as all assessors were provided with identical instructions and demonstration of how to guide participants through

the surveys. The population of assessors also remained consistent. In reference to the follow-up interviews, the primary investigator, thereby ensuring consistency, administered questions. Another strength was the consistent tracking of cycling progression. As cycling progression was recorded every day, it allowed for the detailed examination of individual progression to better understand cycling patterns. Last, as this study was a prospective study, temporal relationships could be established.

### **Future Research and Recommendations**

Based on the limitations addressed previously, future research examining aspects of the LTTW program should consider exploring the source of comparison for children's perceptions of physical competence to determine which population these children are more compelled to compare themselves to and how differing comparisons influence perceptions of the physical self. Future research should also explicitly investigate fear and anxiety toward two-wheeled cycling at all three points of assessment (i.e. pre-camp, post-camp, and follow up). Future research should also establish the weight or importance assigned to the physical domain and measure previous levels of physical activity involvement. The ICF-CY feature 'attitudes' should also be addressed as a distinct component of follow-up interviews.

Lastly, future research should investigate and determine the criteria from which the children were referred by therapists at QACCH. As many parents advocated for an extension of the program, a guide or plan, or follow-up support groups, future research should also attempt to develop and implement such supports for parents to investigate the progression in children's riding after the conclusion of LTTW.

Recommendations to QACCH regarding LTTW include an increase in program length and the development and implementation of follow-up programs, guides, or supports for parents.

Furthermore, providing parents the opportunity to assist their children in riding with one-on-one instruction from LTTW staff may prove beneficial.

### **Conclusion**

To conclude, the Lose the Training Wheels camp affords children with disabilities the opportunity to “ride a conventional two-wheel bicycle and become lifelong independent bicycle riders” (Lose the Training Wheels, 2011, unspecified page) by changing the dynamics of the bicycle and the demands of the environment (Temple et al., 2011). The program is efficacious in its delivery methods; almost all children learned to successfully ride a two-wheeled bicycle by the conclusion of the camp. Further results showed that while self-efficacy toward riding a two-wheeled bicycle increased from pre-camp to post-camp, perceptions of physical competence did not. At a three to six month follow-up, only five out of ten participants were ‘riding’ and self-efficacy decreased for the nine participants who completed the bike riding self-efficacy checklist. Interviews conducted with parents revealed that the lack of services and the consequent re-occurrence of fears and hesitation toward riding significantly influenced successful riding at home. The presence of accessible riding environments and appropriate adaptive equipment also appeared to be important for one participant in the ‘not-riding’ category. The current study adds to the literature on physical activity, cycling, and self-perceptions in children with disabilities, and provides valuable information for QACCH and the community. The results should guide future researchers in this area to investigate, develop, and implement further supports for participants enrolled in the LTTW program so children can continue to ride successfully.

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## Appendices

## Appendix A. Ethics Approval



**UVic/VIHA Joint Research Ethics Sub-Committee**  
 Human Research Ethics, University of Victoria  
 PO Box 1700, Stn CSC, Victoria BC, V8W 2Y2  
 Tel 250-472-4545 Fax 250-721-8960 Web www.research.uvic.ca



Vancouver Island Health Authority, Memorial Pavilion, Kenning Wing  
 1952 Bay Street, Victoria BC, V8R 1J8  
 Tel 250-370-8261 Fax 250-370-8106 Web www.viha.ca

## Certificate of Renewed Approval

PRINCIPAL INVESTIGATOR: <b>Vivienne Temple</b>	<b>ETHICS PROTOCOL NUMBER</b>	<b>J2009-93</b>
POSITION: <b>Faculty</b>	ORIGINAL APPROVAL DATE:	19-Oct-09
DEPARTMENT: <b>EPHE</b>	RENEWED ON:	
	APPROVAL EXPIRY DATE:	18-Oct-13
PROJECT TITLE: <b>Lose the Training Wheels Bike Camp Evaluation</b>		
RESEARCH TEAM MEMBERS: Dr. Patti-Jean Naylor, Co-investigator (UVic), Ms. Alisha Witter (UVic MA Student), Ms. Lynn Purves, Co-investigator (VIHA)		
DECLARED PROJECT FUNDING: <b>None</b>		
<b>CONDITIONS OF APPROVAL</b>		
<p>This Certificate of Approval is valid for the above term provided there is no change in the protocol. Extensions or minor amendments may be granted upon receipt of a Request for Annual Renewal or Modification form.</p> <p><b>Amendments</b>          To make any changes to the approved research procedures in your study, please submit a "Request for Modification" form. You must receive ethics approval before proceeding with your modified protocol.</p> <p><b>Extensions</b>          Your ethics approval must be current for the period during which you are recruiting participants or collecting data. To renew your protocol, please submit a "Request for Annual Renewal" form before the expiry date on your certificate. You will be sent an emailed reminder prompting you to renew your protocol before your expiry date.</p> <p><b>Project Closures</b>          When you have completed all data collection activities and will have no further contact with participants, please notify the UVic/VIHA Joint Research Ethics Sub-Committee by submitting a "Notice of Project Completion" form.</p>		
<b>Certification</b>		
<p>This certifies that the UVic/VIHA Joint Research Ethics Sub-Committee has examined this research protocol and concluded that, in all respects, the proposed research meets the appropriate standards of ethics as outlined by the University of Victoria Research Regulations Involving Human Participants and the Vancouver Island Health Authority Research Ethics office.</p>		
<p>_____          Dr. Rachael Scarth          Associate Vice-President, Research</p>	<p>_____          Ms. Lynn Cummings          Acting Co-Chair, Joint UVic/VIHA Sub-committee</p>	

J2009-93 Temple, Vivienne

Certificate Issued On: 25-Sep-12

## Appendix B. Invitation to Participate



### Lose the Training Wheels Bike Camp Evaluation

Dear \_\_\_\_\_,



Enclosed is an invitation for you and your child to participate in a research study that will evaluate outcomes of the Lose the Training Wheels Camp. This would involve you and your child answering several brief questionnaires about bike riding during and after the camp. Results of the research will help us to learn the best way to teach bike riding.

If you wish to participate in the project please sign the enclosed consent form and have your child sign the assent form.

Please return the one copy of the consent form and the assent form to Ms. Witter via the stamped addressed envelope enclosed by **June 20<sup>th</sup> 2012**.

Lynn Purves  
Senior Physiotherapist  
QACCH

## Appendix C. Consent Form



### Lose the Training Wheels Bike Camp Evaluation



You are being invited to participate in an evaluation of the Lose the Training Wheels Bike Camp. This study is being conducted by Lynn Purves, Vivienne Temple, PJ Naylor, and Alisha Witter.

Sharon Stangeland, Jade Simpson, and Lynn Purves are therapists with the School Age Therapy and Clinics Program of Queen Alexandra Centre for Children's Health. Vivienne Temple and PJ Naylor are faculty members and Alisha Witter is a graduate student in the School of Exercise Science, Physical and Health Education at the University of Victoria.

#### **Aim and objectives**

The purpose of this research project is to learn about the impact of the camp on your child's bike riding and feelings of physical competence. In particular, we want to know about the impact of the camp on your child's cycling, his/her perceptions of bike riding ability and whether there are barriers to cycling following the camp.

#### **Importance of this research**

Research of this type is important because we do not know whether the camp helped your child ride his or her bicycle at home or in your community. Plus we would like to know what else could be done to improve the experience for your child.

#### **Participant selection**

You are being asked to participate in this study because your child is participating in the Lose the Training Wheels Bike Camp in July.

#### **What is involved?**

If you agree to voluntarily participate in this research, your participation will involve completing a one-page checklist about your child's pre-camp bike riding on day 1 or 2 of the camp. This will take approximately 5-minutes. We would also like your consent for:

- Your child to complete a brief questionnaire (about 5 minutes) on first day of camp and again on the last day of camp. The questionnaire asks about your child's confidence to complete bike riding activities (e.g. steer, brake, start) and their perceptions of physical competence. The questionnaire can be read to your child if they prefer.
- The spotters/volunteers to record your child's progress during the camp. Specifically: the type of bike he/she is riding each day, whether the spotter was holding the training handle, and whether your child had sufficient speed.

#### **You and your child may also choose to**

You and your child can also choose to take part in an interview early in the Fall that will ask about your child's bike riding after the camp, about things that helped or hindered your child's cycling, and ideas you have about improving the camp. The interview will take approximately 45 minutes; it will be audio-recorded and then transcribed by Alisha following the interview. No identifying information will be included in the transcription to protect your anonymity.

#### **Risks, inconvenience and benefits**

There are no known risks to you or your child by participating in this research; however it is possible that if your experiences associated with your child's bike riding during or since the camp was not positive, that talking about those experiences may be upsetting. There is some inconvenience to you and your child from this research as the

checklist, survey, and interview (optional) will take up some of your time. The benefits of participating in this research project are that we will be able to make informed decisions about the value of the program to children and families; plus we may be able to act upon suggestions to improve the program in the future.

### **Voluntary Participation**

Your participation in this research must be completely voluntary. Choosing not to participate in this study will in no way effect your child's therapy services or access to Queen Alexandra Centre for Children's camps. The therapists who are project co-investigators from the School Age Therapy and Clinics Program will not be aware of which parents and children agree to participate and which do not. If you do decide to participate, you may withdraw at any time without any consequences or any explanation. If you do withdraw from the study your data will not be used in the study and will be destroyed immediately.

### **Confidentiality and disposal of data**

Your confidentiality and the confidentiality of the data will be protected by removing identifying information from the surveys and transcribed interviews as by using numerical codes for the data rather than names. Data will be stored in a locked cabinet or a password protected computer at the University of Victoria. Only Alisha, PJ, and Vivienne will have access to the raw data. The digital audio of the interviews will be deleted following transcription; and in five years time the electronic files will be erased and the paper files will be shredded. The report provided to the Queen Alexandra Centre for Children's Health will be aggregated data only.

### **Dissemination of Results**

In addition to providing a report to the School Age and Clinics Program staff at Queen Alexandra Centre for Children's Health; we anticipate that an article will be published and that the findings will be presented at the Queen Alexandra Centre for Children's Health and at a conference. The outcomes of the study will be published on Dr Temple's website and individual feedback can be provided to you upon request.

### **Contacts**

Individuals that may be contacted regarding this study include Dr Vivienne Temple PH: 250-721-7846 or email: [vtemple@uvic.ca](mailto:vtemple@uvic.ca); Ms. Alisha Witter PH: 778-977-3153 or email: [alishawitter@gmail.com](mailto:alishawitter@gmail.com); and Ms. Lynn Purves PH: 250519-5390 or email: [Lynn.Purves@viha.ca](mailto:Lynn.Purves@viha.ca). In addition to being able to contact the researcher at the above email addresses and phone numbers, you may verify the ethical approval of this study, or raise any concerns you might have, by contacting the Human Research Ethics Office at the University of Victoria at (250-472-4545) or [ethics@uvic.ca](mailto:ethics@uvic.ca) or the Research Ethics Office at the Vancouver Island Health Authority (250-370-8620).

### **Additional option**

I agree to participate in the follow-up interview in the Fall  Yes  No

If **yes**, please provide your email address and/or telephone number so that Alisha can contact you to arrange a convenient time and place for the interview.

Email address: \_\_\_\_\_ Telephone: \_\_\_\_\_

Your signature below indicates that you understand the above conditions of participation in this study and that you have had the opportunity to have your questions answered by the researchers.

\_\_\_\_\_  
*Child's Name*

\_\_\_\_\_  
*Parent Name*

\_\_\_\_\_  
*Parent's Signature*

\_\_\_\_\_  
*Date*

***Please keep one copy of this form for your records.***

## Appendix D. Assent Form



### Lose the Training Wheels Bike Camp Evaluation

#### ASSENT FORM

My name is \_\_\_\_\_.

I agree to talk with Alisha Witter or PJ Naylor from the University of Victoria or Lynn Purves from the Queen Alexandra Centre for Children's Health about my bike riding skills and how I feel about my skills. Alisha, PJ, or Lynn will ask me questions about my bike riding skills at the beginning and the end of camp. We will talk for about 5 minutes each time. Doing this research will help the Queen Alexandra Centre for Children's Health know how good the camp was and if there are things that could make the camp better.

I decided I would like to be in this study. If I decide at any time that I no longer want to be in the study, I just have to tell Alisha, PJ, or Lynn and they won't ask me any more questions. Nothing I say will affect whether I can go to more camps in the future.

All of my "data" (scores, numbers, and any other information) collected from me will remain confidential. No one will be able to know my name, or know that it was me who was in the study. In fact, instead of using my name, they will use a "secret code." After five years, all of my data will be destroyed.

If I have any questions, my parents or I can call Lynn at 250-519-5390 or Alisha at 778-977-3153. My parents also have a letter that has more information about whom to contact if I have more questions about the study.

Name: \_\_\_\_\_ Date: \_\_\_\_\_

## Appendix E. Parent Questionnaire

### LOSE THE TRAINING WHEELS BIKE CAMP

Child's code #: \_\_\_\_\_

Dear Parent,

To help us better understand your child's progress during the bike camp; we would like you to characterize your child's bike riding before camp.

1. **Type of riding.** In the past six months my child (check all that apply)

- Was **not** riding any type of bicycle
- Was riding a bicycle with training wheels
- Was riding a two-wheeled bicycle with a training handle (see photo)
- Was riding a run-bike
- Was riding a trail-a-bike attached to adult bike (see photo)
- Was riding a tandem bike
- Was riding a tricycle
- Was riding a stationary exercise bike
- Was riding a two-wheeled bicycle with limited success
- Other, please describe



Bike with training handle



Trail-a-bike

2. **Riding confidence.** I would characterize my child's confidence riding a **two-wheeled bicycle** as:

- Not confident at all
- Somewhat confident
- Confident
- Too confident
- Other, please describe

3. **Fear and anxiety.** I would characterize my child's fear and anxiety about riding a two-wheeled bicycle as:

- |   |   |
|---|---|
| <input type="checkbox"/> Very fearful           | <input type="checkbox"/> Very anxious           |
| <input type="checkbox"/> Fearful                | <input type="checkbox"/> Anxious                |
| <input type="checkbox"/> A little fearful       | <input type="checkbox"/> A little anxious       |
| <input type="checkbox"/> Not fearful            | <input type="checkbox"/> Not anxious            |
| <input type="checkbox"/> Other, please describe | <input type="checkbox"/> Other, please describe |

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

4. Is there **anything else you would like to tell us** about your child's riding before camp?

\_\_\_\_\_

**Appendix F. Spotter/Volunteer Checklist**

Child's ID #: \_\_\_\_\_

Day: Mon / Tues / Wed / Thurs / Fri  
*(please circle)*

1. **Bike type.** Check the type of bicycle the participant was riding at the start and end of today's session.

	START	END
LTTW roller bike, roller #1 (easiest)	<input type="checkbox"/>	<input type="checkbox"/>
LTTW roller bike, roller #2	<input type="checkbox"/>	<input type="checkbox"/>
LTTW roller bike, roller #3	<input type="checkbox"/>	<input type="checkbox"/>
LTTW roller bike, roller #4	<input type="checkbox"/>	<input type="checkbox"/>
LTTW roller bike, roller #5	<input type="checkbox"/>	<input type="checkbox"/>
LTTW roller bike, roller #6	<input type="checkbox"/>	<input type="checkbox"/>
LTTW roller bike, roller #7	<input type="checkbox"/>	<input type="checkbox"/>
LTTW roller bike, roller #8	<input type="checkbox"/>	<input type="checkbox"/>
Two-wheeled bike with handle	<input type="checkbox"/>	<input type="checkbox"/>
Two-wheeled bike, no handle	<input type="checkbox"/>	<input type="checkbox"/>

2. Was the participant riding his/her **own bike** today?

Yes, whole session       Yes, part session       No

3. What percentage of riding time did volunteers/spotters **hold the training handle** today? (*mark on line*)

0% \_\_\_\_\_ 100%

4. What percentage of riding time was the participant **riding fast enough** today? (*mark on line*)

0% \_\_\_\_\_ 100%

5. How many times did the volunteers/spotters need to **take the handle to prevent a collision/fall** today?

0      1      2      3      4      5      6      7      8      more than 8

6. Any **other comments** you would like to make about your participant's riding in today's session?

---

## Appendix G. Self-Perceptions Questionnaire

Code: \_\_\_\_\_ Date: \_\_\_\_\_

### HARTER (1985) SELF-PERCEPTION PROFILE FOR CHILDREN (SPPC)

#### Athletic Competence Sub-scale

These next questions ask you to think about yourself in comparison to other kids you know. Please mark the box that best describes you.

### What I Am Like

#### SAMPLE SENTENCE

	Really True for me	Sort of True for me			Sort of True for me	Really True for me	
(a)	<input type="checkbox"/>	<input type="checkbox"/>	Some kids would rather play outdoors.	BUT	Other kids would rather watch T.V.	<input type="checkbox"/>	<input type="checkbox"/>
<hr/>							
1.	<input type="checkbox"/>	<input type="checkbox"/>	Some kids do very <i>well</i> at all kinds of sports	BUT	Other kids <i>don't</i> feel that they are very good when it comes to sports.	<input type="checkbox"/>	<input type="checkbox"/>
2.	<input type="checkbox"/>	<input type="checkbox"/>	Some kids wish they could be a lot better at sports	BUT	Other kids <i>feel</i> they are good enough at sports.	<input type="checkbox"/>	<input type="checkbox"/>
3.	<input type="checkbox"/>	<input type="checkbox"/>	Some kids think they could do well at just about any new sports activity they haven't tried before	BUT	Other kids are afraid they might <i>not</i> do well at sports they haven't ever tried.	<input type="checkbox"/>	<input type="checkbox"/>
4.	<input type="checkbox"/>	<input type="checkbox"/>	Some kids feel that they are <i>better</i> than others their age at sports	BUT	Other kids <i>don't</i> feel they can play as well.	<input type="checkbox"/>	<input type="checkbox"/>
5.	<input type="checkbox"/>	<input type="checkbox"/>	In games and sports some kids usually <i>watch</i> instead of play	BUT	Other kids usually <i>play</i> rather than just watch.	<input type="checkbox"/>	<input type="checkbox"/>
6.	<input type="checkbox"/>	<input type="checkbox"/>	Some kids <i>don't</i> do well at new outdoor games	BUT	Other kids are <i>good</i> at new games right away	<input type="checkbox"/>	<input type="checkbox"/>
<hr style="border-top: 1px dashed black;"/>							
7.	<input type="checkbox"/>	<input type="checkbox"/>	Some kids do very <i>well</i> at riding a two-wheeled bicycle	BUT	Other kids <i>don't</i> feel that they are very good when it comes to riding a two-wheeled bicycle	<input type="checkbox"/>	<input type="checkbox"/>
8.	<input type="checkbox"/>	<input type="checkbox"/>	Some kids find it <i>easy</i> to ride a two-wheeled bicycle	BUT	Other kids find it <i>hard</i> to ride a two-wheeled bicycle	<input type="checkbox"/>	<input type="checkbox"/>

## Appendix H. Self-Efficacy Questionnaire

### Bike Riding Efficacy Checklist

Code: \_\_\_\_\_

Date: \_\_\_\_\_

**1. I can ride a two-wheeled bicycle without someone holding the handle:**

1

2

3

4

Disagree in a big way

Disagree in a small way

Agree in a small way

Agree in a big way

**2. I can ride a two-wheeled bicycle in a straight line:**

1

2

3

4

Disagree in a big way

Disagree in a small way

Agree in a small way

Agree in a big way

**3. I can stop a two-wheeled bicycle using the handbrakes:**

1

2

3

4

Disagree in a big way

Disagree in a small way

Agree in a small way

Agree in a big way

**4. I can start a two-wheeled bicycle without help:**

1

2

3

4

Disagree in a big way

Disagree in a small way

Agree in a small way

Agree in a big way

**5. I can steer a two-wheeled bicycle around corners and obstacles**

1

2

3

4

Disagree in a big way

Disagree in a small way

Agree in a small way

Agree in a big way

**6. I can ride a two-wheeled bicycle in busy places (like on a bike path):**

1

2

3

4

Disagree in a big way

Disagree in a small way

Agree in a small way

Agree in a big way

**7. I can put my own helmet on:**

1

2

3

4

Disagree in a big way

Disagree in a small way

Agree in a small way

Agree in a big way

## Appendix I. Parent Interviews

Participant # \_\_\_\_\_

Date \_\_\_\_\_

*Parent interview*

**1. You indicated that [name] was riding [type of bike] before LTTW and by the end of the camp, [he/she] was riding [type of bike], does this sound about right? Based on that, I'm curious about, how [name's] cycling skills have changed or how they have come along since [name] left camp. What have they been doing in terms of cycling?**

- **Prompt:** Pre-camp to the end of camp; end of camp to now
- **Prompt:** How was [name's] cycling immediately after camp?
  - **Probe:** Was immediate post camp riding successful? Did the success transfer to the home environment?
- **Probe:** Can you tell me about [name's] post camp cycling in terms of:
  - Where they cycle (initially, now)?
  - Who they cycle with (friends, family, volunteer)?
  - Who initiates cycling?
  - How often [name] cycles?
  - For what purposes [name] cycles (recreation, purposeful e.g. ride to school)?
  - How cycling has impacted [name] socially? (e.g., riding to school with friends? Has it been a social as well as a physical outlet for [him/her]?)

***We are interested in understanding what helped or hindered [name] to cycle this summer.***

**2. Can you tell me about the things that were helpful or things that were difficult to transition cycling to home?**

- **Prompt:** Does [name] have a new or modified bicycle? Was the bicycle design helpful? If so, how did it help?
- **Prompt:** Were there things about places or locations for cycling; such as bicycle paths, heavy traffic, paved roads etc.?
- **Prompt:** Were there other people who helped? Friends to cycle with? Was transport to a suitable location an issue?
  - How had LTTW prepared you (or the family member who attended) to assist [name] to continue to cycle? Did you feel confident in your ability to help?
- **Prompt:** What about [name] him/herself, was he/she persistent, eager to cycle, confident in his/her ability, scared to try, sufficient skill to be safe, etc. (attitudes)

- **Prompt:** Were there any services readily available to assist you in factors related to riding such as the maintenance of the bicycles, guidance on effective teaching etc.?

*We are also looking to improve the process and outcomes for the future...*

**3. Are there other things that could be done to assist [name] to cycle or to assist you to help [name] cycle?**

- **Prompt:** Previously you mentioned that \_\_\_\_\_ made cycling difficult this summer; is there something that could be done to help with this?
- **Probe:** Would you use a volunteer?
- **Prompt:** Are there recommendations you would make to municipal councils or recreation planners?

**4. Can you tell us what you would change and what you would keep in relation to LTTW program that you participated in?**

- **Prompt:** Are there things you would change or keep about the application process?
- **Prompt:** Are there things you would change or keep about the camp itself?
- **Prompt:** Are there things you would change or keep about the follow up?

**5. Perceptions and self-efficacy**

**Appendix J. Follow-up Interview Email**

Hello [insert Mr./Mrs. Name here],

My name is Alisha Witter; I was involved with Lose the Training Wheels this past summer, compiling research for my thesis via the questionnaires you were asked to complete. I am emailing to request a follow up interview in regards to your child's bicycle riding and their transition to riding at home. The estimated time for an interview is 45 minutes to 1 hour. Your time is greatly appreciated and I am therefore willing to meet you at a time and location convenient to you. I am available this week and any time after October 14<sup>th</sup>. Thank you very much for your time, I look forward to hearing from you.

Kind regards,

Alisha

(cell # :)