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# SPARK for Learning: Examining Emotion Regulation in Children with SLD

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SPARK for Learning: Examining Emotion Regulation in Children with SLD

by

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A THESIS

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## **Abstract**

The current study investigated the relationship between daily physical activity and emotion regulation in children with a Specific Learning Disorder (SLD) aged 8 to 12 years old. Eighteen children with SLD participating in the SPARK for Learning intervention were matched one-to-one on age and sex to children with SLD in the control group. Students completed self-report measures on emotion regulation and emotion regulation strategies. Overall, results indicated no significant differences in emotion regulation solely based on the SPARK for Learning intervention. For total emotion regulation and the expressive suppression strategy, significant interactions were found across time and group suggesting that the SPARK for Learning intervention impacted students differentially across time. Results of this study suggest that additional research should focus on the SPARK for Learning program to determine what other factors daily physical activity influences.

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*To Mom, Dad & Jerry*

*I am who I am because of you!*

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## **List of Abbreviations**

SLD	Specific Learning Disorders
DSM-IV-TR	Diagnostic and Statistical Manual of Mental Disorders, 4 <sup>th</sup> edition, text revised
DSM-V	Diagnostic and Statistical Manual of Mental Disorders, 5 <sup>th</sup> edition
ERICA	Emotion Regulation Index for Children and Adolescents
ERQ	Emotion Regulation Questionnaire
ADHD	Attention Deficit- Hyperactivity Disorder
RTI	Response to Intervention
BDNF	Brain-Derived Neurotropic Factor
AFER	Antecedent – Focused Emotion Regulation
RFER	Response – Focused Emotion Regulation
ANOVA	Analysis of Variance

## **Chapter One: Introduction**

Some children have difficulty being able to effectively understand and regulate their emotions. As emotions are critical in a variety of aspects in children's lives, difficulties in this area can lead to children struggling in many facets of daily life (i.e., behaviour, social relationships, etc.). Early childhood and adolescence is a period in a student's life that can be challenging and a time of emotional upheaval (Adrian, Zeman, Erdley, Lisa, & Sim, 2011), therefore it is especially important to help students face the emotional challenges they encounter. Unfortunately, children with a Specific Learning Disorder (SLD) may have an increased susceptibility to emotion difficulties (Wong & Butler, 2012) possibly including emotion regulation in addition to academic challenges. A SLD may lead to students struggling emotionally or intensifying existing emotional concerns.

The purpose of the current study is to gain an understanding of the influence of daily physical activity on the emotion regulation and emotion regulation strategies of children with a SLD. There is limited research on the emotion regulation of children with a SLD; thus, the relation between what influences emotion regulation in children with a SLD is unclear. Providing children the opportunity to activate areas of their brain related to emotion during exercise may help improve how these children regulate their emotions. Information regarding the emotion regulation of children with a SLD may influence future interventions and the teaching of emotional importance to children. If it is determined that participating in daily physical activity has an impact on emotion regulation and emotion regulation strategies, wide applications for intervention and the general study of emotion regulation may be possible. For example, if increased physical activity helps improve emotion regulation, suggestions could be made for increasing the amount of physical activity in schools.

The following paper provides a review of the important and relevant research in SLD, emotion regulation, physical activity, and on the SPARK for Learning school-based intervention program. This will provide the reader with knowledge that will help facilitate the understanding of the present study. Following, a detailed description of the current study will be provided, including a description of the participants, measures used, and procedure for the study. Finally, this paper will examine the results of the current study as well as a discussion of what the results mean and the implications the results have. The following section will provide a broad review of the literature as well as introduce the concepts relevant to the present study.

## **Background**

### **Specific Learning Disorders**

Many children and adolescents have academic difficulties; however, when these difficulties exceed what is typical for their age and education, a diagnosis of a Specific Learning Disorder may be warranted. More students are supported in SLD academic programs than any other area of special education (Wong & Butler, 2012). Although prior diagnostic criteria of a SLD stated that a key characteristic of the disorder was average to above-average cognitive abilities (*Diagnostic and Statistical Manual of Mental Disorders, 4<sup>th</sup> edition text revised*, DSM-IV-TR; American Psychiatric Association, 2000), current diagnostic criteria does not take cognitive abilities into consideration (*Diagnostic and Statistical Manual of Mental Disorders, 5<sup>th</sup> edition*, DSM-V; American Psychiatric Association, 2013). Individuals with a SLD typically have a dysfunction in their central nervous system, which can lead to difficulty processing certain types of information (Andrews & Istvanffy, 2012). Therefore, students with Specific Learning Disorders often have difficulty completing basic academic skills in one or more academic areas including reading, writing, and mathematics, even if they receive appropriate

instruction, have good cognitive abilities, and put forth good effort. Students' difficulties may be displayed in various forms and are often focused on a specific skill set within that specific academic domain (i.e., within reading, students may have difficulty with accuracy, fluency, or comprehension). The same is true for difficulties in writing and mathematics, as each difficulty can be displayed in many variations. It is important to note that symptoms and areas of difficulty can vary for each child and situation. Several individuals may be diagnosed with a SLD with impairment in the same academic domain, yet the reasons and processing difficulties behind that diagnosis are often not the same.

A Specific Learning Disorder, as defined in the DSM-V (American Psychiatric Association, 2013), is identified when academic skills based on standardized achievement measures and comprehensive clinical assessment are considerably below what would be expected. The expectation level is based on the individual's age or grade and can cause substantial interference with academic or professional performance (American Psychiatric Association, 2013). Difficulties must persist for at least six months, despite the child receiving targeted interventions. A SLD is a lifelong condition, which has secondary effects and characteristics, often impacting cognitive, social, emotional, behavioural areas (Sattler & Lowenthal, 2006).

**Prevalence Rates and Characteristics.** Prevalence rates of SLD in children and adolescents range from 5 to 15 percent and are, on average, more common in males than females with ratios ranging from 2:1 to 3:1 (American Psychiatric Association, 2013). A SLD is characterized by learning problems that significantly impede aspects of the individual's life, including academic achievement or daily life skills requiring writing, reading, or mathematics (i.e., reading street signs or calculating change when shopping). SLDs can have negative

consequences across the lifespan, such as greater rates of high school dropout, higher rates of unemployment, and poorer overall mental health when compared to typically developing individuals (American Psychiatric Association, 2013). Precursors to specific learning disorders, such as language delays, may start to show when a child is very young; however, a diagnosis of a learning disorder typically occurs during the elementary school years (American Psychiatric Association, 2013).

**Types of SLD.** A SLD is an overarching term, incorporating three different subtypes. An individual with an SLD can have impairment in one (or more) of three general academic areas: reading, writing, or mathematics. However, within each area, students may present with different challenges.

A student with a reading SLD may have trouble with reading accuracy (i.e., identifying and reading words), reading fluency (i.e., the rate of reading sounds, words and sentences), or reading comprehension (i.e., difficulty understanding the meaning of what is read). Researchers have found that approximately five percent of school-age children are diagnosed with a reading disorder and more than 70-90% of students with a learning disorder have a primary difficulty in reading (Hale & Fiorello, 2004).

A student with a SLD with difficulties in written expression may have difficulty with spelling, grammar and punctuation, or with the clarity or organization of their writing. Prevalence rates for a SLD in written expression range from 6% to 18 % (Katusic, Colligan, Weaver, & Barbaresi, 2009); however a SLD in writing is often comorbid with other learning disorders (American Psychiatric Association, 2013; Hale & Fiorello, 2004).

Finally, an individual with a SLD may have impairment in mathematics. Children with a SLD with impairment in math have difficulty understanding mathematical concepts.

Specifically, children may have difficulty with number sense (i.e., understanding the relationship between numbers), math calculation (i.e., accurately computing and carrying out the steps involved in calculation), math fluency (i.e., completing basic math facts accurately and correctly), or math reasoning (i.e., solving math word problems; American Psychiatric Association, 2013). Between one and six percent of school-aged children are diagnosed with a mathematical learning disorder (Geary, 2004). Research has shown that students with learning disorders not only find math computation more difficult than typically developing individuals but that they often struggle to obtain key mathematical skills and concepts behind math computation (Witzel, Riccomini, & Scheider, 2008).

Along with a diagnosis of SLD, a severity level of mild, moderate, or severe is typically given. A mild severity level would be given when an individual struggles in one or two academic areas; however, the difficulty is minor enough that the individual can still function well when provided with appropriate support services (American Psychiatric Association, 2013). A moderate severity level would be given to an individual who is having difficulties in one or more academic areas; however, he or she would require intensive and specialized support in the areas of difficulty moving forward with his/her academics. A severe level would be identified when an individual is having difficulty in several academic areas and requires ongoing, intensive, or individualized teaching (American Psychiatric Association, 2013).

**Diagnosing SLD.** SLD are diagnosed through a series of methods, including observations, standardized tests and interviews typically completed by psychiatrists or psychologists. Methods of diagnosing include: the Intelligence-Quotient (IQ) – Achievement Discrepancy Model, Response to Intervention, and the profile of strengths and weaknesses. For many years, the intelligence quotient (IQ) - achievement discrepancy model has been used as the

primary method to diagnose learning disorders (Sattler & Lowenthal, 2006). The discrepancy model requires a significant discrepancy between an intelligence quotient (IQ score) and the achievement standardized test score in reading, writing, or math (Sattler & Lowenthal, 2006), with a discrepancy of one standard deviation (i.e., 15 points) typically constituting a significant difference. If there is a significant discrepancy between the scores, the individual may be diagnosed with a Specific Learning Disorder. However, the use of the IQ-achievement discrepancy model has been criticized as a way of determining SLD (Hale, Kaufman, Naglieri, Kavale, 2006) and researchers have noted this approach may both over- or under-identify learning disorders (Kavale, Holdnack, & Mostert, 2005). Therefore, researchers are moving towards finding a better way of understanding, examining, and diagnosing SLD.

A second approach to the identification of SLDs is through Response to Intervention (RTI). RTI refers to multi-layered interventions which progressively shift in focus from classroom-based to individual-based support, making use of progress monitoring and screening points to identify children in need (Fletcher, Coulter, Reschly, & Vaughn, 2004). Diagnostic models that use RTI have an opportunity to provide early intervention and services to reduce inappropriate identification and to help a large amount of struggling students in an appropriate time frame (Fletcher et al., 2004). RTI is used as a technique to detect students having difficulties (i.e., academic, social/emotional, etc.) while monitoring their progress in the education system.

The problem solving approach and the standard protocol approach are two methods used in the RTI method (Sattler & Lowenthal, 2006). The problem solving approach uses classroom teachers to identify children at risk, through achievement test scores and comparisons to other children. The teachers consult with other members of the school based team (i.e., special



education teachers, school psychologists) to create and implement instructional programs (Sattler & Lowenthal, 2006). The standard protocol approach involves intensive tutoring using a standard validated protocol or other teaching methods (Sattler & Lowenthal 2006). Those who have similar difficulties are given the same intensive instruction. Advantages of this approach include standard instructions, implementation, and simple procedure of evaluation. This approach includes some disadvantages such as: the intervention may not be suitable for all students with the same problem, or schools may not have the finances to support an intense intervention. One main difference between the two approaches is who implements the programs. The standard protocol approach makes use of trained tutors, whereas the problem solving approach uses teachers who consulted with other personnel to implement programs. Another difference is the actual procedures used. The problem solving approach uses different procedures for different children based on the teacher or school, whereas the standard protocol approach uses the same standard procedure for every school/teacher.

The RTI method has some advantages, including requiring early assistance be provided to children, linking assessment and teacher instruction, and potentially lowering the number of children diagnosed with a SLD. Unfortunately, this method also has disadvantages: students who may require intensive assistance may have to wait longer to receive such help, and many questions remain unanswered (length of intervention, effectiveness; Sattler, & Lowenthal, 2006).

A third way of recognizing a SLD is the profile of strengths and weaknesses across different cognitive areas or academic domains (Fenwick et al., 2015). This approach suggests that students with a SLD display areas of strengths and weaknesses. Examining the strengths of children is important, as the focus in research and classrooms is typically on the weaknesses of children with a SLD. The profile of strengths and weaknesses model believes that students with

a SLD have a specific difficulty rather than generalized learning difficulty. Therefore, the difficulty is due to the impairment of a specific neurological function and not all cognitive functioning (Compton, Fuchs, Fuchs, Lambert, & Hamlett, 2012). The strengths and weakness model is based on the following characteristics. First, the full scale IQ is not vital except for an Intellectually Disabled (ID) diagnosis (Compton et al., 2012). The full scale IQ is not essential, because it is believed that student's scores vary based on their individual strengths and weaknesses. Second, children who are identified as having a SLD have cognitive and academic abilities mostly within the average range; however, they have one or two isolated areas of weakness. This model suggests that those students who struggle academically in one area also have strengths in other areas (Compton et al., 2012).

**Comorbidities.** Children with SLD often present with comorbid, or co-occurring, conditions, including attentional, communication, Autism Spectrum, depression, and anxiety disorders (American Psychiatric Association, 2013). SLDs are often highly comorbid with Attention Deficit – Hyperactivity Disorder (ADHD) as students with a SLD are at greater risk for a diagnosis of ADHD (DuPaul, Gormley, & Laracy, 2012). Approximately 35-45% of children who have a SLD have a comorbid diagnosis of ADHD (DuPaul & Stoner, 2003; DuPaul et al., 2012). Specifically, DuPaul and Stoner (2003) reviewed studies carried out between 1982 and 1993, and found that rates of ADHD in the SLD population ranged from approximately 18% to 60%, with an average of 38.2% across studies. More recently, DuPaul and colleagues (2012) conducted a meta-analysis of 17 studies from 2001-2011. They found a higher comorbidity rate (45%) between SLD and ADHD than what has been previously reported. Due to high comorbidity rates between learning disorders and ADHD, as well as the common emotional concerns that arise with both disorders, these disorders are of great interest to researchers.

For children with a SLD and associated comorbidities, emotions are often an area of difficulty. Improving how these children view and experience emotion can have an impact on their daily lives. Children with a SLD are often faced with academic or social situations which lead to strong feelings (i.e., confusion, frustration, or anger). Students with specific learning disorders often have an inadequate vocabulary regarding feelings and emotions and therefore have trouble recognizing these emotions in themselves and others (Elias, 2004). These difficulties can lead to students with a SLD having comorbidities with emotional disorders, and therefore may struggle in areas such as emotion regulation.

### **Emotions**

Emotions can influence several aspects of an individual's life, including his/her mental health. Emotions are defined as multi-layered, coordinated changes in an individual's body that can impact the subjective experiences and behaviour of that individual (Mauss, Bunge, & Gross, 2007). Emotions arise when an individual reacts to a situation and determines it as relevant or important (Gross & Thompson, 2007). Both positive and negative emotions may have an influence on an individual's thoughts, decisions, actions, memories, and perceptions (Kassam, Markey, Cherkassky, Loewenstein, & Just, 2013). Emotions can serve to improve well-being, as they play a vital role in assisting an individual meet his/her interpersonal and social support needs (Kassam et al., 2013). For example, emotional experiences (e.g., happiness, sadness, anger, fear, shame, or guilt) can influence a child's academic engagement, work ethic, commitment, and overall school success in both positive and negative ways (Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011). As relationships and emotional processes affect how and what students learn, addressing emotional issues is an important aspect of school life. Good social-emotional skills are associated with well-being and better school performance, whereas a

failure to effectively develop these skills can lead to personal, social, or academic difficulties (Durlak, et al., 2011). When students lack social-emotional skills, they often become less connected to their school, which may negatively impact their academic performance, health, and overall behaviour (Blum & Libbey, 2004).

In addition to previously mentioned diagnostic comorbidities, SLDs are often comorbid with emotional difficulties. A student, who is diagnosed with a SLD, faces many day-to-day challenges that test his/her emotions. For students with a SLD, the feelings they often experience during a day are often those of sadness, happiness, or anger. However, when examined in greater depth, these feelings may in fact be frustration, anxiety, disappointment, or even excitement and the individual may not know how to accurately express him or her self (Davis, Nida, Zlomke, & Nebel-Schwalm, 2009). In many instances a SLD may enhance some emotional concerns that are already established with the individual; however, a SLD may bring out new emotional distress for that individual. These emotions may interfere with the learning process. One area of difficulty involving emotions that students with SLD face is that of emotion regulation.

### **Emotional Regulation**

Emotion regulation can be defined as the combination of processes at the physiological, cognitive, and behavioural levels which control internal or external emotional expression (Eisenberg, Spinrad, & Smith, 2004). Gross and Thompson (2007) believe that emotion regulation refers to a variety of processes that are used to control and maintain the physiological and behavioural aspects of affective responses. Emotion regulation is the process one uses to start, stop, or adjust the intensity and duration of one or more aspects of emotional response (Gross, 2007; Bosse, Pontier & Treur, 2010). In general, emotional regulation tries to explain

how and why emotions facilitate or impair aspects of an individual's life (Hannesdottir & Ollendick, 2007).

Whether positive or negative, emotions are a part of our everyday lives (Gross & Thompson, 2007). The process of regulating these emotions involves increasing, decreasing, or balancing positive and negative emotions (Gross, 1998). Emotion regulation informs the way individuals react in situations including how one feels inside as well as how one represents themselves to others. Determining what emotion one is feeling and knowing how to regulate emotions is important, particularly during social interactions (Gross, 2002). In a social context, one must interpret, comprehend, and appropriately respond to different emotional situations. When interacting with others, one must empathize with how the other person is feeling (Cohen, 2006), understand non-verbal communication (Knapp, Hall, & Horgan, 2014), and regulate one's own emotions based on what is occurring around them (Gratz & Roemer, 2004). Using the external cues from others, an individual must assess his or her own emotions and respond accordingly in a socially acceptable manner. The process of regulation involves being able to recognize and adjust the emotion one is feeling (Gross, 2002; Uy et al., 2013). Therefore, being unable to successfully regulate emotions can have huge impacts on one's daily life. Successful emotion regulation has been associated with positive outcomes, better relationships, and improved academic and work performance (John & Gross, 2004). Successfully regulating emotions can lead to a more emotionally-balanced life as the emotional ups and downs balance out.

Conversely, emotional dysregulation is when an individual has emotional responses which are out of his/her control, which may lead to anger or other aggressive emotions (Gratz & Roemer, 2004). Emotion dysregulation is often associated with psychopathology, including

depression, anxiety, and therefore perhaps specific learning disorders. Therefore, children who have difficulty acquiring and mastering strategies for emotion regulation early in life may have problematic outcomes, such as social incompetence or externalizing problems such as physical aggression, bullying and defiance.

### **Theoretical Underpinnings**

Currently, there are two emotion regulation models. The two models are: an integrative model of activation and dynamics within the attachment system (Mikuliner, Shaver, & Pereg, 2003) and a process model of emotion (Gross, 1998; 2002). Each model provides a differing perspective on the way in which emotion regulation occurs as well as how and why one regulates emotions.

The integrative model of activation and dynamics focuses on individual differences in emotion regulation based on attachment theory and research. This model of attachment theory illustrates emotion regulation with three major components: monitoring and appraisal of threatening events, the availability of attachment figures and the feasibility of proximity seeking. Mikuliner et al. (2003) suggest that self-regulation is facilitated by the expansion of a person's perspective, self-growth and development, and the roles that were originally fulfilled by those they were attached to. Therefore, this model suggests that secure people regulate their emotional distress alone using the sense of security established through interactions with supportive and stable attachment figures (Mikuliner et al., 2003). In contrast, insecure people are less successful in regulating their emotions as they do not have the support of attachment figures.

The process model suggests that specific strategies can be differentiated among the timeline of an emotional response (Gross, 2002). The fundamental aspect of this model is that emotion regulation strategies differ in when they have the greatest impact on the emotion

response process (Gross, 2002). The process model suggests that an evaluation of external or internal cues is how emotion starts. This evaluation leads to a set of behavioural, experiential, and physiological emotion responses (Gross, 1998). Using this model, emotion is regulated in two major ways: antecedent-focused emotion regulation (AFER) and response-focused emotion regulation (RFER). Gross (1998) suggests that antecedent-focused emotion regulation occurs early and intervenes before emotion responses have been fully activated. A person using AFER strategy would avoid or approach a situation based on the emotional impact it is expected to have. Individuals reappraise the situation and alter their emotion toward or away from a specific emotion. For example, a student who is nervous about an upcoming exam would prepare ahead of time, expect anxious emotions, and act accordingly. The RFER pathway suggests that emotion regulation occurs after the emotion is experienced. For example, a student using an RFER strategy would wait until he or she is actually feeling an anxious emotion during the exam before beginning the process of regulating his or her emotions.

Within the process model of emotion regulation, there are several different steps that can be used to help regulate emotions. These steps include: situation selection, situation modification, attention deployment, cognitive change, and response modulation (Gross, 2015). Situation selection refers to actions that make it more or less likely that an individual will experience a specific emotion (Gross, 2015). An example of situation selection is choosing to avoid an activity you know will make you unhappy. The next step, situation modification, refers to actions that will directly alter the situation as a way to change the emotional impact of that situation. An example of situation modification is, when feeling nervous during a speech an individual may tell a joke to help relieve some tension. Attention deployment refers to the process of redirecting one's attention with the goal of impacting the emotional response (Gross,

2015). In this step, an individual would alter his or her attention either toward or away from an emotional response (i.e., thinking of something positive to feel happy). Cognitive change refers to altering one's appraisal of a situation in order to influence its emotional impact. In this step, an individual would change how he or she looks at a situation (i.e., instead of feeling anxious about a test, one might think about how the test will be over soon). Response modulation refers to directly influencing experiential, behavioural, or physiological components of the emotional response after the emotion is already developed (Gross, 2015). In this step, individuals often keep emotions to themselves, and not let themselves show others how they are feeling. Based on the limited empirical support for the integrative model, the overwhelming amount of research supporting the process model of emotion regulation (Gross, 1998, 2004, 2015), and the alignment of the chosen questionnaires for the present study, the current study aligns with the theoretical framework of the process model of emotion regulation.

### **Emotional Regulation Strategies**

Several strategies have been implemented as a way to regulate emotions; however, strategies that can be used in everyday life may have greater improvements in emotion regulation (John & Gross, 2004). To determine what strategy is appropriate for children and adolescents with SLD more research into emotion regulation is needed with this population. One primary area of research interest is the difference between AFER and RFER strategies, specifically between cognitive reappraisal (an AFER) and expressive suppression (a RFER).

Expressive suppression involves the inhibition or lack of expressing emotions as a manner of emotional regulation (Gross & Levenson, 1993; John & Gross, 2004). Suppression of emotional responses involves being able to inspect one's emotions and have an emotional awareness: monitoring the exterior bodily state (for example thinking, "Am I showing my



emotions outwardly?") as well as interior emotional state ("What is my emotion now?"; Giuliani, Drabant, Bhatnagay & Gross, 2011). This strategy seeks to prevent the outward expression of emotion after the emotional response has been generated (Giuliani et al., 2011). An example of expressive suppression would be when an individual feels sad and instead of expressing or sharing his or her emotions, he or she would keep these emotions private.

Cognitive reappraisal is a process that involves an emotionally-stimulating situation or experience. It involves the need to change the emotional response one is feeling; essentially, it refers to altering emotions by changing the way one thinks (John & Gross, 2004; McRae & Ciesielski, & Gross, 2012). An example of cognitive reappraisal would be an individual feeling sad about a recent event, and, as a way to regulate his/her emotions, he or she would consciously change what they are thinking about to something more positive. Cognitive reappraisal is a complex strategy that involves holding a goal to reappraisal in working memory and determining alternative appraisals by examining the significance, causes, and potential outcomes of an emotional situation (McRae et al., 2012). The individual must select among these options, maintain the new appraisal in working memory, and monitor the success in changing his/her emotional state (Ochsner & Gross, 2008).

Therefore, an individual using cognitive reappraisal would change how he or she is thinking about that situation to change his or her emotions whereas someone using expressive suppression may decide to keep these emotions to him or herself. Reappraisal may require less cognitive effort than suppression, as suppression involves continually inhibiting emotions (Gross, 2002). John and Gross (2004) determined that individuals who use reappraisal as a strategy are more likely to look for something positive during stressful life events than those who do not use the reappraisal strategy.

As children and adolescents learn to regulate their emotions, they learn to recognize a variety of different emotions and are able to handle and express emotions effectively and appropriately (John & Gross, 2004). Unfortunately, many students, including those with SLD, often experience increased risk for emotional concerns including emotion regulation.

### **Emotion Regulation and Psychopathology**

A number of psychological conditions have impairments in emotional regulation which may affect several aspects of physical and mental health (Campbell-Sills & Barrow, 2007). These impairments in emotion regulation are often initially displayed in childhood or adolescence (Davidson & Slagter, 2000), including bipolar disorder (Gruber, Harvey & Gross, 2012), anxiety disorder (Goldin & Gross, 2010), depression (Joorman & Gotlib, 2010), ADHD and perhaps SLD. Of particular importance for the purpose of this study are the emotion regulation abilities of children with SLDs.

**Specific Learning Disorders.** Specific Learning Disorders typically focus on struggles with academic achievement; problems in self-regulation and social interactions also may exist. Some researchers have suggested that having a Specific Learning Disorders may negatively affect a child's social or emotional functioning because the disabilities influence the child's ability to develop positive interpersonal relationships (Bryan, Burstein & Ergul, 2004). Many children with SLD have some form of emotional challenge associated with their learning difficulty (Wilson, Armstrong, Furrie, & Walcot, 2009). SLDs may lead to emotional concerns or intensify existing emotional concerns. Students with a SLD tend to have higher levels of emotional concerns, such as depression, loneliness, and low self-esteem than their typically developing peers, which can increase the risk of developing emotion regulation problems (Blum & Libbey, 2004; Bryan et al., 2004). Children with a SLD often have some social-emotional

difficulties, such as poor emotion recognition, and poor social and emotional understanding (Bauminger, Schorr-Edelsztein, & Morash, 2005). Some researchers have suggested that learning disorders may negatively affect a child's social or emotional functioning because the disabilities influence the child's ability to develop positive interpersonal relationships (Abrams, 1986). Without social and emotional skill development at an early age, these children may experience lifelong struggles (Lerour & Levirr-Perlman, 2000).

Peer rejection and having few friends has an impact on the emotional well-being of those with a SLD (Wong & Butler, 2012). Students who struggle with their learning often display difficulty with their emotional development and social skills leading to troubles with their behaviour (Mercer, Mercer, & Pullen, 2011). Therefore, it may be difficult for children with SLDs to acknowledge and interpret social cues or regulate their emotions or behaviours to fit in with peers. Children with SLDs are often at a higher risk for bullying, victimization, rejection, and feelings of loneliness. Students with SLD are more likely than their typically developing peers to experience challenges actively participating in conversation, receiving or providing negative feedback, or resolving conflicts (Wong & Butler, 2012). Children with a SLD also display difficulty interpreting critical social cues and have difficulty with social perspective taking. As emotions are an important in many of these situations, understanding and regulating someone's own emotions influence the day-to-day lives of many children. The use of emotion regulation strategies may help children cope with these emotions on a regular basis.

One of the emotional struggles children with a SLD face is connected to self-esteem. Singer (2008) examined methods used to protect the self-esteem regarding academic failure in young children who have learning disorders. Students who were able to regulate negative emotions in addition to working hard, seeking parental support, and distracting themselves to

complete academic tasks had higher self-esteem. Approximately 36% of their population attempted to hide feelings of sadness, anger, and frustration from peers and teachers through distraction (Singer, 2008). This finding suggests that students with learning disorders may use emotional regulation as a way to protect their self-esteem. Therefore, if given additional support and ways to improve emotion regulation (i.e., physical activity), potential changes on students' self-esteem could be found.

Overall, students with a specific learning disorder often struggle emotionally and may have challenges understanding how to control, interpret, and express different emotion (Bryan et al., 2004). Both positive and negative affect and emotions can influence learning and students' social relationships and problems in emotion regulation influences responses in social situations (Bryan et al., 2004).

**Attention Deficit-Hyperactivity Disorder.** Children with ADHD often display a lack of inhibitory control as a result of the executive functioning difficulties associated with the disorder. One way this inhibitory control impacts someone is through emotion deregulation leading to a lack of emotional and behavioural inhibition (Barkley, 2006). Due to the incapability to delay or regulate their emotions and associated behaviours, children with ADHD are often more aggressive, destructive and defiant than their typically developing peers (Maedgen & Carlson, 2000). Due to a lack of ability to inhibit emotions, behaviours and social difficulties, children with ADHD are often less liked by their teachers and peers, and have fewer friends than typically developing peers (Hoza et al., 2005). Children with ADHD are often rejected by their peers (Hoza et al., 2005), which can be psychologically damaging and may results in additional psychiatric and emotional challenges.

**Social-Emotional Concerns.** Children with specific learning disorders often struggle in areas of social/emotional functioning (Bryan et al., 2004). Social/emotional development includes the expression and management of emotions the ability to establish effective and rewarding relationships with others (Elias et al. (1997). Research examining students with and without a SLD and negative feelings (i.e., depression, anxiety, and loneliness) suggest that with a SLD are more likely than typical students to experience these feelings (Wiener & Schneider, 2002). Students with a SLD may have high levels of emotional difficulties including poor emotion regulation have been found at risk for behavior problems. Therefore some of the behavior problems, student with a SLD may show may be traced back to poor emotion regulation (Bryan et al., 2004). Coleman and Vaughn (2000) state that students with a SLD and social emotional difficulties have less opportunities to experience academic success and interactions with teachers, receiving less exposure to curriculum and mastering academic content.

### **Physical Activity**

Physical activity is defined as any bodily movement produced by muscles that substantially increases the energy an individual uses over that during periods of rest or inactivity (Bouchard, Clair, & Haskell, 2006). Children and adolescents participate in a variety of physical activity, depending on their age, access to programs, and community or school resources. Physical activity can vary in presentation, and can be structured, leisurely, repetitive, planned, individualized, or group focused (Bouchard et al., 2006). Typically, school-aged children participate in free play, running, jump rope, tag, hide and seek, and games usually involving others. As children get older, their physical activity changes and develops into resistance exercises, often using weights, and may become more intense (Bouchard et al., 2006).

The physical activity and fitness of Canadians over the past several decades has decreased, whereas being overweight or obese has increased (Colley et al., 2011). Canadian guidelines suggest that children and adolescents ages five to seventeen years should engage in 60 minutes of moderate to vigorous physical activity each day (Colley et al., 2011). Despite the recommended amount of time spent on physical activity, many children and young adults are not engaging in an adequate amount of daily physical activity (Dollman, Norton, & Norton, 2005).

Engaging in regular physical activity is an effective preventative measure for health risks across ages, gender, ethnicity, and socioeconomic standing (Janssen 2007; Janssen & LeBlanc, 2010). Physical activity has also been shown to improve mental health and cognitive performance, which may lead to better academic achievement (Biddle & Asare, 2011; Singh, Uitdewilligen, Twisk, Van Mechelen, Chinapaw, 2012). Physical activity habits are established during the early years in life; therefore, engaging children in physical activity when they are young may help activity levels as they get older (Olstad & McCargar, 2009). When physical activity is done prior to or during puberty, it can have several benefits, including improved bone mass and lower risk of heart disease (Gunter, Almstedt, & Janz, 2012). Researchers have also suggested that children and adolescents who participate in physical activity have reduced risk of developing cardiovascular disease, obesity, and other health concerns (Andersen, Riddoch, Kriemler, & Hills, 2011; Janssen & LeBlanc, 2010).

High levels of physical activity have been associated with a large variety of health benefits, while its absence can have many severe effects on health and well-being (Naylor, MacDonald, Zebedee, Reed, & McKay, 2006). Children and youth who are physically active are commonly more focused in their classroom and perform better in mathematics, science, and

other subjects than children who are not physically active (Naylor et al., 2006). The change in performance may be associated to the neurological connections associated with physical activity.

### **Neurological Connections**

Physical activity performed with a moderate to vigorous heart rate for 20 minutes or more has been found to impact learning, mental health, and stress (Ratey & Hagerman, 2008).

Linking physical activity and the neurological connections is an area of study becoming more prevalent area to research. Exercise has been found to increase levels of neurotransmitters and brain-derived neurotropic factor (BDNF), which are associated with cell survival, synaptic development, learning, and memory (Kramer & Erickson, 2007). BDNF is a protein that may improve the quality of brain health and plasticity by supporting neuron survival, and supporting the growth and variation of new neurons and synapses, particularly in the hippocampus (Mata, Thompson, & Gotlib, 2010; Ploughman, 2008). Research has found that lower levels of BDNF are associated with Major Depressive Disorder (Duman & Monteggia, 2006). Physical activity has been shown to increase BDNF levels in the hippocampus (Cotman & Berchtold, 2002), cerebral cortex, cerebellum, striatum, and amygdala (Zoladz, 2010) which may enhance overall brain health.

During physical activity, the brain is activated, receiving more blood flow to areas essential to learning (Maeda & Murata, 2004). Physical activity is required for healthy brain growth, particularly areas of the brain involved in regulating behaviour and emotions. Physical activity has been shown to be beneficial to an individual's overall cognition and many explanations have been suggested. Exercise increases the amount of blood and oxygen exposed to the brain (Jorgensen, Nowak, Ide, & Sechley, 2000), helps in the creation of new nerve cells (Singh et al., 2012), and increases the amount of norepinephrine and endorphins in the brain,

which reduces stress and improves mood (Winter et al., 2007). Overall brain functioning, specifically processing and ability to maintain attention, has been said to increase after moderate to intense exercise for a period of time (Ratey & Hagerman, 2008). Physical activity increases the transfer of tryptophan, a serotonin precursor, across the blood-brain barrier (Trudeaw & Shephard, 2009). The transfer of tryptophan then increases cerebral serotonin which has a calming effect on the individual.

Physical activity has also been shown to improve executive functioning, behavioural inhibition and emotion regulation, which are often areas of impairment in children with ADHD and SLD (Davis et al 2011; Wigal, Emmerson, Gehricke, & Galassetti, 2013). Additionally, research indicates that moderate physical activity can lead to increases in the overall social-emotional functioning and behaviour of students with ADHD and SLD (Verret, Guay, Berthiaume, Gardiner, & Beliveau, 2012). As a result, physical activity programs may be used as a possible intervention to improve behavioral and social-emotional outcomes for this population of children.

### **Psychological Benefits**

In addition to the many physical and neurological benefits of physical activity, it has also been shown to have an impact on psychological health (Wipfli, Rethorst, & Landers, 2008). Physical activity and mental health research is important to study in children and adolescents as many of these influences can carry on through the lifespan, yet the child population and the mental health field has received significantly less attention than in adult populations (Whitelaw et al., 2010). Studies that have been conducted in this area have largely been in the area of depression, anxiety, and self-esteem. Although very few studies examine the effect of physical activity on SLDs, students with SLDs are at higher risk for developing anxiety and depression.



Children with SLDs often participate in less physical activity and have higher rates of obesity than other children (Riner & Sellhorst, 2013). Participating in physical activity may be beneficial for areas in which students with SLDs have difficulty, including social experiences and emotional well-being (e.g., providing opportunity to laugh, be involved in a group or team).

Emerging research suggests that physical activity may have a positive effect on the functioning of students with ADHD and SLD (Wigal et al., 2013). Research has suggested that moderate to intense exercise at a target heart rate for a given period of time results in improved brain functioning across a number of domains, including learning, memory, attention, mental health, and stress (Ratey & Hagerman, 2008). Multimodal treatment for ADHD and SLD, which includes a variety of medical interventions/pharmacological treatment, behavioural, psychological interventions, and educational supports, is generally considered to be the most effective approach (Wigal et al., 2013).

Physical activity has been shown to improve the behavioural effects of children with ADHD. Specifically, Wendt (2000) studied adolescent boys diagnosed with ADHD who participated in activities involving daily running. After a six-week intervention, the boys displayed improvements in their behaviours as measured on the Connor's Parent Rating Scale, and some children were able to reduce their medication levels. Reynolds, Nicolson, and Hambly (2003) evaluated an activity-based program for children high risk for reading difficulties. Using balance and coordination exercises, Reynolds and colleagues (2006) examined the effects on junior high students with a diagnosis of dyslexia, dyspraxia, or ADHD. They found significant improvements in the cerebellar functioning and reading ability of their participants.

Given the extent of the physical and psychological benefits of physical activity, there may be benefits to engaging children and adolescents with SLD in physical activity. One avenue

to engage a large amount of children to daily physical activity is through a school-based intervention.

### **School-based Interventions**

A large variety of influences affect physical activity in youth (Wipfli, et al. 2008). . However, as children spend a large portion of their day in the classroom, school-based interventions may have the most opportunity to influence children. School-based interventions are programs that occur in a school context and are often led by school staff or trained professionals who are invested in the school (Climie & Deen, 2014). Traditionally, school-based interventions have focused on academic improvements; however, they may also be beneficial for other areas of student functioning. Schools play a significant role in helping children develop not only cognitively, but in their social-emotional development as well (Durlak, Weissberg, Taylor, & Schellinger, 2011).

Traditionally, periods of physical activity within elementary schools has been limited to lunch, recess, and physical education classes. However, implementing an intervention that aims to increase physical activity in addition to the conventional methods may lead to increased benefits. In the past few years, there has been a tendency toward decreasing the amount of physical education required in schools, despite the evidence supporting the necessity for maintaining if not increasing physical education (Thomas et al., 2004; Huberty et al., 2010). Schools offer unique opportunities for physical activity; however, with increasing pressure to improve academic scores, there is often a predisposition to cut back on physical activity in schools to make more instructional time for academic subjects, such as reading or mathematics. The reduced instructional time for academic subjects is one argument against increasing the time allocated to physical activity in schools. However, Keeley and Fox (2009) concluded that

increasing physical activity at the expense of academics did not have harmful effects on the academic performance of children. In fact, Trudeau and Shephard (2008) report that cross-sectional studies typically indicate a positive association between physical activity and academic achievement.

Up to 50% of a child's waking hours are spent in school; therefore, schools have been promoted as an ideal setting for the implementation of prevention programs (Naylor et al., 2006; Neil & Christensen, 2009). School-based interventions are seen as ideal for physical activity as they can reach a large variety of children and adolescents, have trained personnel, and have an organized structure (Trost, Rosenkranz & Dzewaltowski, 2008; Pate et al., 2000). School-based interventions are a way to influence students regardless of their socio-economic status or ethnicity (Burke, Meyer, Kay, Allensworth & Gazmararian, 2008). The need for schools to play a larger role in the socio-emotional well-being of youth is becoming more noted as school infrastructure, environment, rules, curriculum and staff have potential to positively influence child development (Brown & Summerbell, 2009). In addition, school-based physical activity can have secondary effects of making students more confident and comfortable during physical activity outside of the school system.

### **SPARK for Learning**

SPARK for Learning is a school-based intervention centered on increasing students' physical activity each day (Climie & Deen, 2014; Ratey & Hagerman, 2008). The school venue allows the SPARK for Learning program to be accessible to a variety of children without relying on additional cost or time for parents. SPARK for Learning is a school-based intervention program that was developed as a method to increase physical activity in children and adolescents.

As part of the SPARK for Learning program, students participate in 20 minutes of moderate to intense cardiovascular activity during the first period of each school day. The exercise activities consist of fitness circuits in the hallways, modified games in the gym (e.g., tag games), a workout video, or “Walking Wednesdays.” Each day, students do a variety of different activities to maintain interest in the program. The emphasis of SPARK for Learning is on student participation and effort, rather than skill (Climie & Deen, 2014).

### **Present Study**

This research project utilized a collaborative approach where researchers worked with school staff to implement the intervention and evaluate its impact on several areas of functioning. The current study was conducted as part of a larger study on the physical activity intervention (SPARK for Learning) and its impact on children with SLD. This study examined the relationship between daily physical activity and emotion regulation of students with SLD. Specifically, the present study examined whether daily physical activity would improve the emotion regulation and the emotion regulation strategies of children with SLD. A non-participating comparison group was used to determine whether any difference in emotion regulation was in part due to the SPARK for Learning intervention. Understanding how to build resilience in children through protective factors (i.e., physical activity) may help children who are struggling to regulate their emotions.

Late childhood and early adolescence is often a time of heightened emotions (Adrian, et al., 2011). Therefore determining ways to help individuals understand and appropriately express these emotions is essential in their development. Although the importance of emotions in this age group is known, very few studies have examined emotional regulation in this population. In addition, no previous research has investigated the relationship between physical activity and

emotion regulation in children with Specific Learning Disorders. Therefore, the research questions and hypothesis stated for the current study are based on a review of the literature. The study aims to address the following questions:

1. Does a daily physical activity intervention program influence the emotion regulation of students with SLD? Are there differences in students' emotion regulation between the participation group and the control group?
2. Does a daily physical activity intervention influence the emotion regulation strategies used by students with SLD? Are there differences between the participation group and the control group?

In relation to the first research question, children with a SLD have been found to have poor rates of emotion regulation (Bauminger et al., 2005), which can add to the difficulty of expressing and sharing their emotions with others. In addition, physical activity has been shown to change the levels of BDNF in the brain, as well as other neurotransmitters (Cotman & Berchtold, 2002) that influence emotions in an individual. Although, there are no studies examining a link between physical activity and emotion regulation, based on the association between physical activity and the associated effects on the brain, it is hypothesized that students participating in the SPARK for Learning intervention program will improve their overall emotion regulation abilities throughout the course of the intervention in comparison to those not participating in the program.

In regards to the second research question, physical activity has been shown to improve endorphins and neurotransmitters in the brain (Winter et al., 2007). Physical activity has also been linked to improving social emotional behaviours (Verret et al., 2012), which may influence students to be more expressive about their emotions. Although no literature has examined the

association between physical activity and emotion regulation strategies, it is hypothesized that participating in SPARK for Learning may help children to better express their emotions rather than keeping emotions to themselves. As such, it is believed that children participating in the SPARK for Learning program will make improvements through the use of the cognitive reappraisal strategy and reduce their use of the expressive suppression strategy.

## Chapter 2: Methods

### Participants

Total participants in the current study included 36 students ranging from 8 to 12 years of age ( $M = 9.59$  years,  $SD = .62$ ), from a large western Canadian city (61% male, 39% female). Students were either part of the participating group (those part of the SPARK for Learning program,  $M = 9.58$ ,  $SD = .61$ ) or the control group (those not in the SPARK for Learning program,  $M = 9.59$ ,  $SD = .64$ ). The children who took part in the study were required to meet specific criteria to be eligible for participation. Specifically, all children involved in the current study received a previous diagnosis of a Specific Learning Disorder from a psychologist or psychiatrist. Students attended a congregated school and had to meet school board criteria to attend this school. Students could have a diagnosis of any subtype of learning disorder and many students had co-morbid disorders (e.g., ADHD).

Prior to the academic year, the researchers met with staff and administrators at the congregated school to discuss the SPARK for Learning intervention. Following this meeting the interested teachers contacted the researchers stating interest in the SPARK for Learning intervention and their class became the participating group. Consent forms were sent to parents of students in this class, and those that were signed and returned became participants in the SPARK for Learning intervention. During the meeting prior to the academic year, researchers mentioned a need for a control group as a manner at which to compare the effects of the SPARK for Learning intervention. Interested teachers contacted the researchers, stating that they will be willing to have their classrooms be used for the control group. Consent forms were sent to parents of students in the various interested classrooms. Students who returned the parent consent forms signed became the participants in the control group.

Participants in the SPARK for Learning program were matched one-to-one with participants in the control group, based on age (+/- three months) and sex to ensure that both groups included a similar number, and had similar demographic information. Demographic information is displayed in Table 1.

Table 1.

*Demographic information*

Variable	Category	Participating				Control				Total			
		<i>n</i>	%	<i>M</i>	<i>SD</i>	<i>n</i>	%	<i>M</i>	<i>SD</i>	<i>N</i>	%	<i>M</i>	<i>SD</i>
Age		---	---	9.58	.61	---	---	9.59	.64	---	---	9.59	.62
Gender	Male	11	50	---	---	11	50	---	---	22	50	---	---
	Female	11	50	---	---	11	50	---	---	22	50	---	---
Diagnosis	SLD	17	94.4	---	---	5	27.8	---	---	22	61.1	---	---
	SLD/ADHD	0	0	---	---	6	33.3	---	---	6	16.7	---	---
	SLD/SE	0	0	---	---	4	22.2	---	---	4	11.1	---	---
	SLD/ADHD/SE	1	5.6	---	---	2	11.1	---	---	3	8.3	---	---
	SLD/Comm Dis.	0	0	---	---	1	5.6	---	---	1	2.8	---	---

SLD – Specific Learning Disorder  
ADHD –Attention Deficit – Hyperactivity Disorder  
SE – Social / Emotional Disorders  
Comm Dis – Communication Disorder

## Measures

Participants completed measures independently to gain accurate information about their individual emotion regulation abilities and strategies. The current study examined data gathered through the administration of the Emotional Regulation Index for Children and Adolescents (MacDermott, Gullone, Allen, King, & Tonge, 2010) and the Emotion Regulation Questionnaire (John & Gross, 2003).

**Emotional Regulation Index for Children and Adolescents (ERICA).** The Emotional Regulation Index for Children and Adolescents (ERICA; MacDermott et al., 2010) is a 17 item



self-report measure of emotional regulation for children and adolescents. The ERICA was adapted from the Emotion Regulation Checklist for Adolescents (ERCA; Bisecker & Easterbrooks, 2001), which measured emotion regulation in adolescents 16 years or older. MacDermott and colleagues (2010) revised the original items to allow for administration to children as young as nine years old. This resulted in simplified language and appropriate substitutions made. Changes by MacDermott and colleagues (2010) included item simplification such as changing “I am a cheerful person” to “I am a happy person” and changing “Impulsive” to “I do things without thinking about them first.” All items on the ERICA are measured on a five point Likert scale ranging from one (strongly disagree) to five (strongly agree). The ERICA generates a total overall emotion regulation (ER) score, as well as scores for each of the three factors: Emotional Control, Emotional Self-Awareness, and Situational Responsiveness.

Emotional control is an individual having control over his/her emotions, therefore not having emotional outbursts (MacDermott et al., 2010). The emotional control subscale consists of eight items and assesses students’ socially inappropriate emotional expressions (MacDermott et al. 2010). Items on the emotional control subscale are reflective of dysregulated negative affect or inappropriate emotional displays; therefore, all items in this subscale are reverse scored. Reverse scoring this subscale means that a self-reported lower response (i.e., two out of five) would be reversed to a higher score (i.e., four out of five), signifying higher emotional control. An example item from this subscale is “I have trouble waiting for something I want.”

Emotional self-awareness is the ability to be emotionally flexible and recognize emotions (MacDermott et al. 2010). This subscale consists of five items and measures an individual’s self-awareness of his/her emotions and emotional modulation. An example question from this subscale is “When I get upset, I get over it quickly.”

Situational responsiveness assesses socially-appropriate sensitivity and responses (MacDermott et al. 2010). This subscale consists of four items and measures an individual's empathy and situationally-appropriate affective displays. An example item from this subscale is "When other kids are friendly to me, I am friendly to them." A higher overall total score on the ERICA represents more adaptive or functional ER indicating the individual is able to regulate their emotions more effectively.

Psychometrically, the ERICA demonstrates good reliability and validity. Both internal consistency (.75) and test-retest reliability (.77) coefficients are within the acceptable range for the total score (MacDermott et al., 2010). When each of the three factors are examined independently, the emotional control subscale has acceptable internal consistency (.73) and test-retest reliability (.76), the situational responsiveness subscale has slightly lower internal consistency (.64) and test-retest reliability (.74), and the emotional self-awareness scale has the lowest internal consistency (.60) and test-retest reliability (.64). Both the situational responsiveness and emotional self-awareness scales have a lower number of items (four or five items) that likely contribute to the lower consistency and reliability numbers.

**Emotion Regulation Questionnaire (ERQ).** In addition to the ERICA, students completed the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003). The ERQ is a 10 item self-report measure of emotional regulation, six items which assess cognitive reappraisal and four items which assess expressive suppression. All items are measured on a seven point Likert scale ranging from one (strongly disagree) to seven (strongly agree). An example from the cognitive reappraisal subscale is "When I want to feel more positive emotion (such as joy or amusement), I change what I'm thinking about." An example from the expressive suppression subscale is "I keep my emotions to myself."

When used with adolescents and young adults, the ERQ has good psychometric properties. The cognitive reappraisal subscale (.79) and expressive suppression subscale (.73) both have good internal consistency. Both subscales also have good test-retest reliability (.69) for both scales after a three-month period. Psychometric data for a younger population is unavailable for the ERQ.

## **Procedure**

The current study used an experimental study design, which includes a treatment group and a control group as well as pre- and post-intervention testing. The researchers collaborated with school staff to implement the intervention and evaluate its impact on several areas of functioning. A strengths-based approach enabled participants to identify, acknowledge, and work with the strengths of participants as a starting point for cognitive, behavioural, and social-emotional change. This study was part of a larger study on the SPARK for Learning intervention.

Approval from the University of Calgary Conjoint Faculties Research Ethics Board and local school boards was obtained for all aspects of this study. Parental consent was attained from all students who participated in the study. Consent forms were sent home to parent(s) or guardian(s) to read over and sign prior to the children participating in any SPARK for Learning research testing sessions. Although all children one class participated in the program as part of their daily curriculum, only those for whom consent was obtained were involved in the research component of the program. Parents were also provided with researcher contact information if they had any further questions regarding the program. Researchers gained assent from children, seeking their firm agreement prior to inclusion in the study. Specifically, the researchers explained the procedures to the children and ensured that they understood what they would be

doing. Confidentiality was assured and students along with their parents were told they could discontinue their involvement in the study at any time. Children were given the opportunity to ask questions before and during the sessions. Testing commenced only when the researchers have deemed that the child understood the procedures and were willing to participate.

To determine the effectiveness of the SPARK for Learning intervention, participants were tested during two sessions. A pre-test session took place at the beginning of the academic year (September/October) and a post-test session was conducted at the end of the academic year (May/June). Questionnaires were given to students during class time, when the teacher deemed appropriate. The researcher read the questionnaires to the students and clarified any questions they had. All testing was completed by trained research assistants.

### **Chapter 3: Results**

Data was analyzed for normality by examining histograms and boxplots, as well as skewness and kurtosis. An analysis of T-score distribution was conducted to examine for potential extreme outliers (values exceeding  $\pm 3.29$ ; Tabachnick & Fidell, 2007). Histograms and normal probability plots were also examined for normality. One extreme outlier was found. This outlier was winzorized to bring the value within the acceptable range. The final distribution appears to be reasonably normally distributed. Due to participants being matched based on age and sex, missing values were not an issue.

To ensure accuracy in scoring and data entry, a co-researcher reviewed 25% of data for errors. Due to discrepancies and errors during a first examination, data was re-examined, 100% by researcher and 25% by the co-researcher. A Cronbach's alpha analysis was conducted to check for reliability between the researchers data. A final Cronbach's alpha between co-researchers was acceptable at  $\alpha = 1.0$ . Test-retest reliability was examined on the total ERICA score and was found at  $\alpha = .769$ . The ERQ test-retest reliability was conducted on both the expressive suppressive subscale and the cognitive reappraisal subscale and was found at  $\alpha = .422$  and  $\alpha = .877$  respectively.

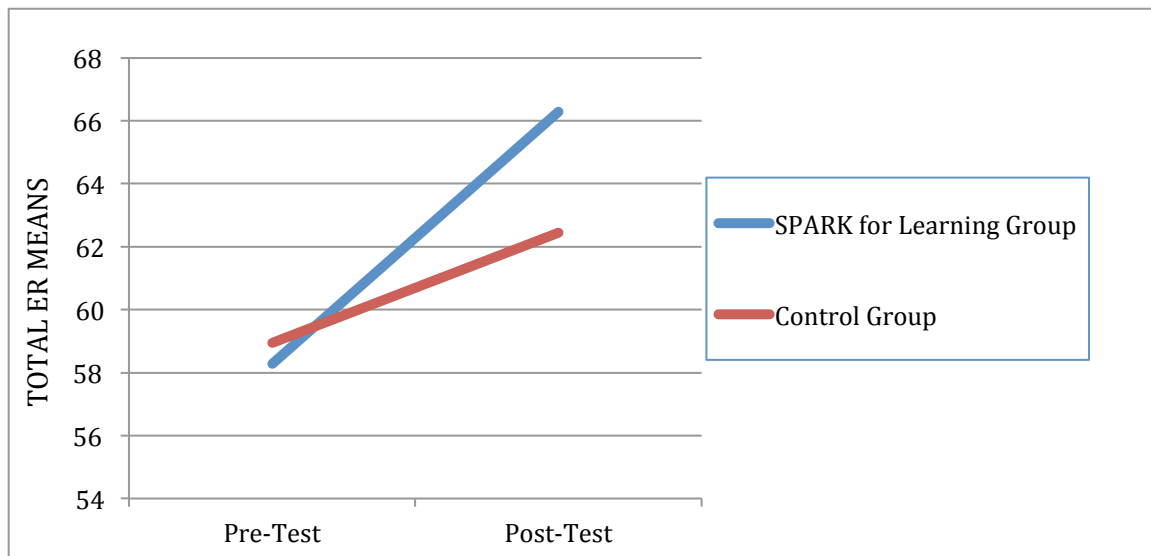
Prior to running the main analysis of the current study, a t-test was conducted in order to determine if the SPARK for Learning group and the control group differed in terms of their ages. As expected due to participant matching procedures, no significant differences were found between groups,  $t(34) = .027, p = ns$ .

#### **Emotion Regulation**

To examine the first research question, a series of repeated measure mixed model Analysis of Variance (ANOVA) analyses were conducted to examine whether or not the level of

total emotion regulation and subscales on the ERICA differed between groups across the course of the SPARK for Learning intervention, as reported by the child. A significant main effect in total emotion regulation across the academic year, between pre-test and post-test ( $F(1, 34) = 84.92, p < .05, \eta^2 = .714$ ) was found for all students in both groups. A significant interaction in the self-reported total emotion regulation between the passage of time from pre-test to post-test and between participating and control groups was found,  $F(1, 34) = 13.01, p < .05, \eta^2 = .277$ . This result suggests that both the passage of time (pre-post) and the SPARK for Learning variable interacted and had a significant effect on students' scores. When the effect size is examined, it suggests that 27% of the change in scores is due to the interaction between time and group. When examined alone, no significant main effect was found for group participation,  $F(1, 34) = .773, p = ns$ . See Figure 1.

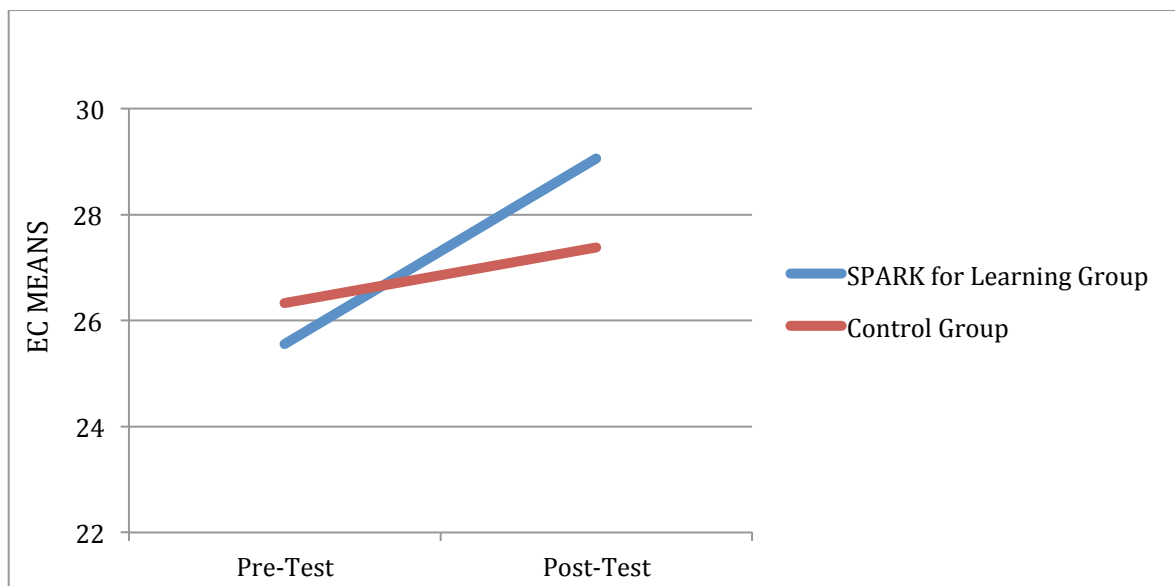
Figure 1: Total emotion regulation means across the academic year for both groups.



To gain a more in depth understanding of student's emotion regulation skills, further examination of the three subtests on the ERICA contributing to the total emotion regulation score was conducted. A repeated measure ANOVA indicated a significant main effect in the self-

reported emotional control subtest across the academic year from pre-test to post-test,  $F(1, 34) = 7.16, p < .05, \eta^2 = .174$ . Specifically, students made increases in emotional control across the span of the academic year from pre-test ( $M = 25.94, SD = 4.86$ ) to after the intervention ( $M = 28.22, SD = 4.21$ ). No main effect was found for group participation,  $F(1, 34) = .124, p = ns$ . No significant interaction was found between emotion control pre-post and whether students participated in SPARK for Learning,  $F(1, 34) = 2.06, p = ns$ . This result suggests that the whether students were in the control or participating group did not influence students' emotional control scores when examined alone or when combined with the passage of time. See Figure 2.

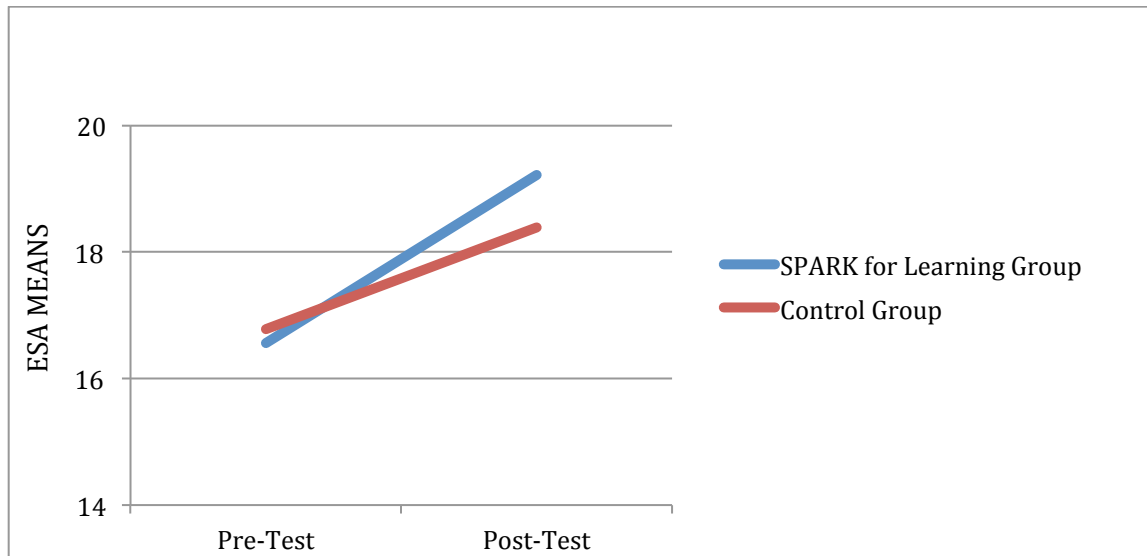
Figure 2: Emotional control means across the academic year for groups.



To examine the emotional self-awareness subscale, a repeated measure ANOVA was conducted. There was a significant main effect on this subscale across the academic year, from pre-test to post-test,  $F(1, 34) = 15.46, p < .05, \eta^2 = .313$ . Specifically, all students, regardless of group, improved their emotional self-awareness from pre-test ( $M = 16.66, SD = 3.42$ ) to post test ( $M = 18.81, SD = 2.86$ ). When examined alone, no significant main effect was found for regardless of group membership,  $F(1, 34) = .112, p = ns$ . No significant interaction was found

between the passage of time and whether students were in the participating or control group,  $F(1, 34) = .941, p = ns$ , suggesting that although the length of time across the academic year influenced scores of emotional self-awareness, participating in SPARK for Learning did not. See Figure 3.

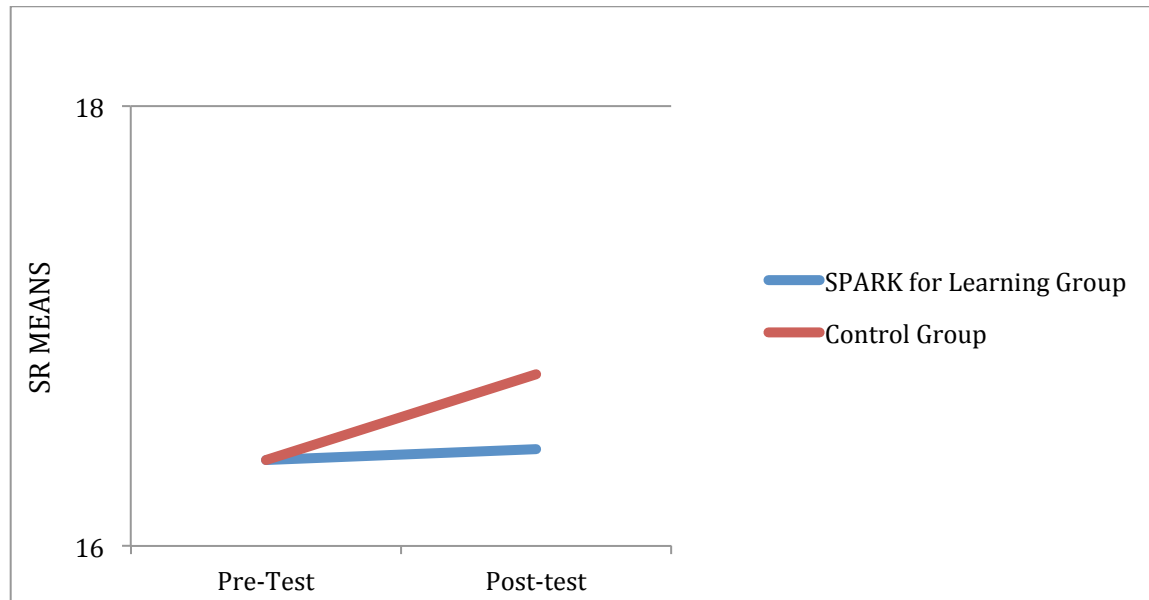
Figure 3: Emotional self-awareness means by group across academic year.



There was no significant main effect for the situational responsiveness subscale for across the academic year,  $F(1, 34) = .411, p = ns$ . No significant main effect on student's situational responsiveness was found based on group membership,  $F(1, 34) = .066, p = ns$ . There was also no significant interaction between self-awareness pre-post and being in the control or participating group,  $F(1, 34) = .231, p = ns$ . This result suggests that neither the passage of time or the whether or not they were in the SPARK for Learning group influenced the student's self-reported situational responsiveness skills. See Figure 4.



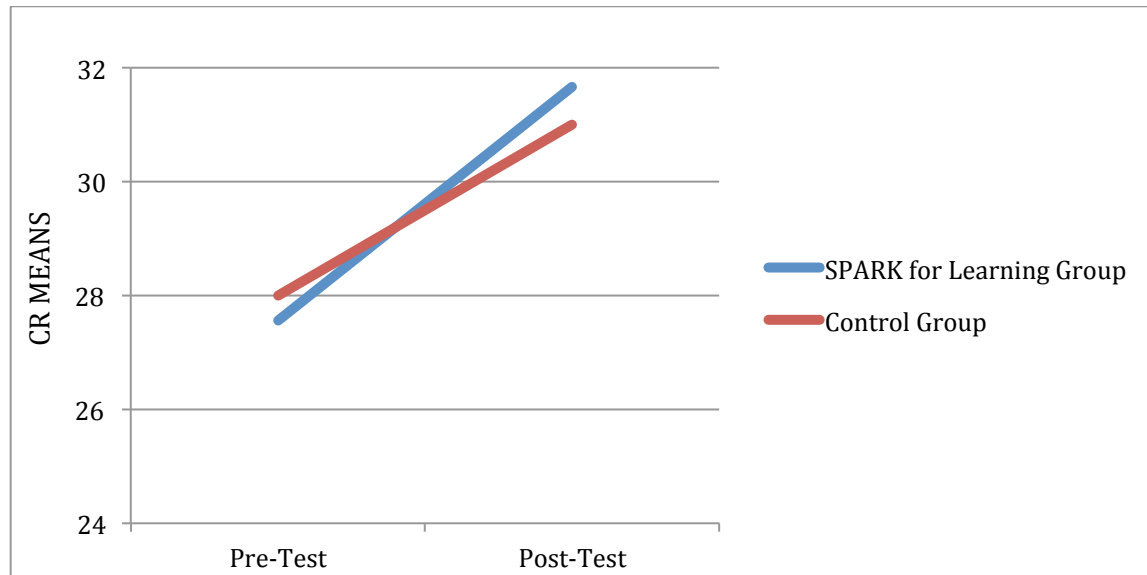
Figure 4: Situational responsiveness means by group across the academic year.



### Emotion Regulation Strategies

To examine the second research question and determine if participating in SPARK for Learning had an effect on the strategies in which students used to cope with emotion regulation, repeated measure mixed method ANOVAs were conducted. When the cognitive reappraisal variable was examined, there was a significant main effect for the passage of time,  $F(1, 34) = 24.26, p < .05, \eta^2 = .416$ . No main effect on cognitive reappraisal for whether students were in the SPARK for Learning program was found,  $F(1, 34) = .003, p = ns$ . There was no significant interaction between the length of time passed from pre-test to post-test and whether students were in the participating or control group, for the cognitive reappraisal strategy,  $F(1, 34) = .592, p = ns$ . The results for the cognitive reappraisal strategy suggest that although there was a difference across the academic year, the SPARK for Learning program alone and when combined with the passage of time across the academic did not impact the student's responses. See Figure 5.

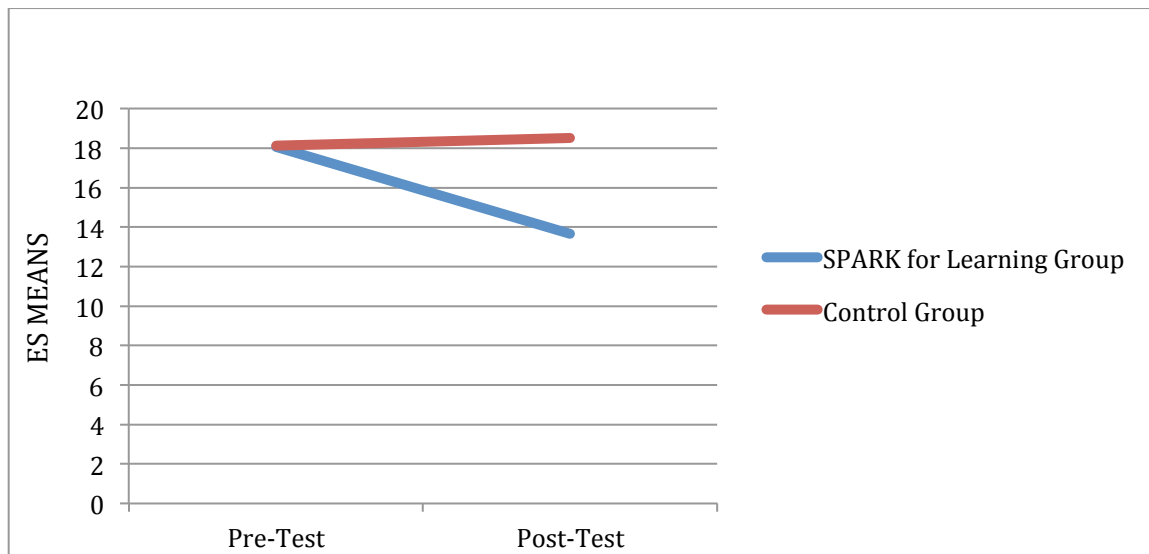
Figure 5: Cognitive reappraisal means across the academic year by group



A final split-plot repeated measure ANOVA was conducted to examine the effect of SPARK for Learning on the expressive suppression strategy that students reported using for their emotion regulation. There was no significant main effect for the expressive suppression variable for the passage of time,  $F(1, 34) = 3.59, p = ns$ . No significant main effect was found for the group variable was found,  $F(1, 34) = 2.82, p = ns$ . However, there was a significant interaction between expressive suppression pre-post and whether students were in the SPARK for Learning program,  $F(1, 34) = 5.13, p < .05, \eta^2 = .007$ . The results for the expressive suppression strategy suggest that that although when examined alone the passage of time across the academic year and the SPARK for Learning program did not influence student's responses, the interaction of the two did. When the effect size is considered, .7% of the variability within student's responses may be contributed to the interaction between time and the SPARK for Learning intervention. As this effect size is very small ( $\eta^2$  less than .10) this interaction should be examined with caution (Pelham, 2013). Specifically, students participating in the SPARK for Learning group decreased their scores of expressive suppression from before ( $M = 18.05, SD = 5.81$ ) to after the

intervention to ( $M = 13.66$ ,  $SD = 3.91$ ). Students in the control group had similar scores across the academic year, as both their pre testing score ( $M = 18.11$ ,  $SD = 6.24$ ) and their post testing score ( $M = 18.5$ ,  $SD = 5.31$ ) are similar. See Figure 6.

Figure 6: Expressive suppression mean by group across academic year.



## **Chapter 4: Discussion**

The current study was completed as part of a larger research project focusing on resilience in at-risk children. The purpose of the current study was to explore the possible relationship between daily physical activity and emotion regulation in children diagnosed with a SLD. In the past few years, there has been an increased focus on the examination of resilience in at-risk students, with a particular interest in understanding factors that can help build and strengthen resilience in these children. Unfortunately, children with a SLD have been found to be at a greater risk for developing emotional difficulties, including emotion regulation (Bryan et al., 2004). Physical activity has been indicated as a method to cope with some challenges in children with emotional challenges (i.e., depression, anxiety; Bauminger et al., 2005). The current study examined physical activity in students with a SLD with an interest in better understanding how physical activity may impact student's self-reported emotion regulation. Overall, results of the current study suggest that although not significant alone, when examined across time and in combination with student maturation, physical activity may be a way to build and support emotion regulation. In addition, these results lead to implications for schools, teachers, students, and clinicians, and influence future research in physical activity and emotion regulation within this at-risk population.

### **Emotion Regulation**

The first research question looked at the effect of a daily physical activity program on the emotion regulation of students with a SLD, specifically examining the differences between the participating and control groups. Hypothesis one predicted that children participating in the SPARK for Learning intervention would rate themselves as having better emotion regulation post intervention than those not participating in the intervention. This hypothesis was not

supported, as results suggest that over time all students, regardless of group membership, improved in emotion regulation. When examining results based solely on group membership, no differences were found. Conversely when time and group membership were examined together, results of the current study suggest that, over time the intervention effected the SPARK for Learning. As such, emotion regulation for participants in the SPARK for Learning group changed more over time than the participants in the control group. Therefore, current results may be contributed to a combination of the growth students experience across the academic year and the SPARK for Learning program.

Although, no statistically significant differences in total emotion regulation were found based on the SPARK for Learning intervention alone, results may be clinically important, indicating that although not statistically significant the intervention could be important to the daily living of children. For example, an improvement of a few points of emotion regulation may not seem significant when examining statistical changes, but for that student the change may have great practical importance.

Given the findings of student's total emotion regulation, it is believed that the SPARK for Learning program in collaboration with student maturation and self-awareness across the academic year impacted students. This finding is consistent with other research that suggest physical activity increases neurotransmitters and BDNF in the brain (Kramer & Erickson, 2007). The growth in neurotransmitters and BDNF could be an explanation for some of the success of the SPARK for Learning program, as previous research has connected physical activity to improvements in learning, memory, and other areas of the brain (Ratey & Hagerman, 2008). These factors in combination with student maturation may impact student's responses of emotion regulation.

Given that all students, regardless of group, made some improvements in overall emotion regulation over the course of the year, other variables may be contributing to this change. These differences could be due to the impact of a congregated setting, small class sizes, attentive teachers who are trained/experienced to work with students with SLD, or students feeling safe and secure at school. Students may have matured over the course of the study, becoming more aware of emotions. As all students in the study made gains in overall emotion regulation, the differences cannot be solely attributed to the SPARK for Learning program but rather the roles of individual student growth and the interaction of maturation and the intervention.

Based on the findings from the overall emotion regulation score, an examination of the three subtests that make up the overall score was completed. The passage of time (pre-test to post-test) was significant regardless of group membership for both emotional control and emotional self-awareness subscales. The significance of the variable of time suggests that through the academic year, students responses on these areas of emotion regulation changed. One possibility for this significant time effect could be due to student maturation. Throughout the academic year, students become more mature. Students are learning more about how their bodies react to specific situations, how to better understand their emotions, and how to express these emotions in a successful manner. Therefore, simply assessing student's emotion regulation across this time span may be subjected to maturation changes and effects, regardless of the SPARK for Learning program. Due to the growth in emotion regulation found in both groups across time, some of the changes in emotion regulation may be contributed to student maturation.

Another possible explanation for the growth over time could be due to the specific teachers and school environment. A healthy school culture can provide a cohesion that bonds the school together to create student success that challenges negative influences (Osher et al., 2007).

Across the academic year students may become more relaxed and comfortable in their school environment and may feel more comfortable regulating their emotions. The school itself may also become more focused on the importance of expressing emotions effectively. The school may have provided education on emotions and how to effectively express these emotions through health classes or other school-wide curriculum projects.

No differences were found with the situational responsiveness subscale, regardless of group membership or time. One possible reason for this could be a restricted range. The situational responsiveness subscale contained only four questions to assess this aspect of student's emotion regulation. Given the limited number of questions in this subscale, student responses may be limited in the amount of growth that is possible given the restricted range. Therefore, it could be possible that if given more questions regarding situational responsiveness, students may have had an increased opportunity to demonstrate growth in this area.

Another possibility for the lack of improvement in student's situational responsiveness responses could be time. Although all students (regardless of group) had growth in emotional control and emotional self-awareness, it could be possible that being emotionally aware of social situations could take more time than that of an academic year. Additionally, given that social situations are often a challenge for students with specific learning disorders (Wong & Butler, 2012) making growth in this area may be more of a challenge than other areas of emotion. Providing students with greater opportunities to interact socially during the daily physical activity may lead to greater improvements in this area and could be examined in future research.

### **Emotion Regulation Strategies**

The second research question looked at the effect of daily physical activity on the emotion regulation strategies that students use, specifically examining the differences between

the control and participating groups. The second hypothesis of the current study stated that students participating in the SPARK for Learning intervention would increase their use of cognitive reappraisal and decrease their use of expressive suppression, whereas those not participating in the intervention would have no changes. This hypothesis was not supported, as physical activity alone did not impact the use of strategy; however, when examined across time the intervention affected both groups differently for students use of the expressive suppression strategy but not cognitive reappraisal strategy. In collaboration with growth across the academic year, participating in the SPARK for Learning allowed students to decrease their use of the expressive suppression strategy, indicating that over time students no longer kept emotions bundled up inside. This decrease may be due to students learning other ways to deal with their emotions.

The act of exercising itself may be a way in which students can express themselves emotionally. When feeling positive or negative emotions, students may be able to use exercise to release and express emotion instead of keeping emotions inside. Therefore, although students may not be using cognitive reappraisal to express these emotions, they may be no longer keeping them bottled up inside. Students may not know the benefits of exercising beyond the physical aspects and therefore may be unaware of the effects on emotion. A discussion of emotions and ways to effectively express these emotions could help students further extend the emotional influences. Therefore, the current findings could influence how students view physical activity and emotions. Although no differences were found in the use of cognitive reappraisal between the participating and control groups, all students significantly improved their use of this strategy throughout the academic year.



The significant interactions found for both the total emotion regulation and expressive suppression variables across time and group suggests that the intervention is impacting both groups differently across time. One possibility for this could be student exposure to the program. The longer students are in the program the greater the influences of physical activity, suggesting that it takes time for some of the effects of the intervention to show. One way to examine this in the future would be increase the number of testing sessions (i.e., have a mid-point testing session). This could allow researchers to determine if the intervention is having an immediate impact or if changes are made more gradually. A follow up testing session (e.g., three months after the conclusion of the school year) would also be beneficial to see how the intervention continued to influence children. For example, did scores of total emotion regulation plateau, spike, or decreases after a period of time? A follow-up testing session could help determine the effects of the SPARK for Learning program across a longer period of time.

Overall, the SPARK for Learning intervention alone did not have an effect on student emotion regulation responses. Student maturation or other variables across an academic year seemed to help improve students emotion regulation and strategies more so than daily physical activity. However, some interactions between time and the intervention occurred suggesting that the intervention is impacting both groups differently over time. For this reason, it is believed that including a program, such as SPARK for Learning, into school systems could lead to many positive implications.

## **Implications**

The current study contributes helpful and practical information regarding emotion regulation for children and adolescents with SLD, their families, teachers, and researchers in the respected fields. As students with SLD often have social-emotional concerns, providing support

for these children to overcome these issues is important. The results of the current study demonstrate that daily physical activity in combination with student maturation may be beneficial for students with a SLD, specifically regarding student's overall emotion regulation and use of the emotion regulation strategy of expressive suppression.

As noted, the findings of this study have many potential implications for students with a SLD. First, this study helps bring the topic of emotions to the forefront. As previously stated, children with a SLD often face emotional issues, some of which arise due to the difficulties associated with SLD while other issues may be intensified due to the disorder. Unfortunately, these issues are not often openly discussed. Increasing conversations and focusing attention toward emotions can be a start toward helping children deal with their emotional concerns. Therefore, an important implication of this study is the importance of engaging in more open and honest discussion regarding emotions with children. Encouraging children to become more aware of emotions and how to effectively regulate these emotions may be a step towards providing necessary support.

Clinicians may wish to examine the current findings and determine whether or not to recommend the incorporation of daily physical activity programs to parents, teachers, and schools. As students spend several hours of their day at school, implementing a program such as SPARK for Learning, may be a easy and inexpensive way to increase opportunities for participating in physical activity. For researchers, the current study serves to enhance the current body of empirical knowledge about the effects of daily physical activity on the emotion regulation of students with SLD, and may inspire future research directions. Researchers may wish to examine the effects of SPARK for Learning on other aspects of emotion regulation or within other populations.

## **Limitations**

As with any project, the current study is not without limitations. As such, the conclusions drawn from the present study should be interpreted in light of these limitations. The following section will discuss the limitations of the current study and provide suggestions to ways to reduce these limitations moving forward.

The first limitation is that the data was gathered through the self-reports of children. Although self-reports are often a useful technique to gain an understanding of how a child is feeling, including teacher or parent reports may have provided additional reliability and strength to the project. In addition to using self-reports, a second limitation of the current study is that students completed the questionnaires in a written format. Given the nature of the study and the identification of SLD in these participants, the use of questionnaires that required students to read and respond may have impacted results. Although researchers read each question and possible response aloud, students who had challenges may still have been impacted by the format of the questionnaire.

A third limitation of the present study is the use of the Emotion Regulation Questionnaire. This questionnaire has had limited use with younger children. Therefore, the language used may have been complex and potentially beyond the comprehension level of the students in this study. However it should also be noted that students were observed when completing the questionnaire and no issues were observed with the content of the questionnaire (e.g., no questions were raised). If students did have questions, researchers were close by to address any concerns students may have had.

A final limitation of the current study is that of recruitment. Students participating in the SPARK for Learning intervention were recruited from one classroom. However, those in the

control group were selected from four different classrooms. Although students were similar in many ways, having students spread across four different classrooms could lead to an increase of variables not within the researchers' control. As well, individual teaching style may have played a role in the outcome of this project. Based on their background and previous experiences, teachers have different methods which they believe are best for teaching emotion or physical activity. As participants were spread amongst various teachers, different teaching styles and personal beliefs may have affected how they taught their students.

Despite its limitations, the present study uniquely contributes to the literature on emotion regulation and explores new avenues for intervention with a unique population of students. Given its innovative nature, the present study gives rise to many new questions and creates new directions for future research.

### **Future Research**

The SPARK for Learning program could be expanded in several ways. Researchers have options to extend the current research by examining SPARK for Learning in other areas, focusing on emotion regulation, or by looking at the combination of both together. The following section will discuss some possible future research directions.

One potential direction for future research is to examine the SPARK for Learning program in relation to different groups of children. The present study examined the impact of physical activity on students with SLDs. However, it may be interesting to determine if SPARK for Learning has similar findings with a different population of students (i.e., students with solely ADHD, high school students, those in a regular classroom environment, etc.). Future research could also examine the impact of daily physical activity on other aspects of development (i.e., behavioural, cognitive, or academic changes). This additional research exploration may provide

teachers and researchers with additional information on the utility of the SPARK for Learning program in schools.

It may also be interesting to examine the different strategies children use to regulate their emotions and when they choose to use a specific strategy. The present study examined two different strategies to regulate emotions; however, the scope of the study did not include analysis of when students use which strategy. Examining when students use a specific strategy would be particularly beneficial to expanding the understanding of emotion regulation in children. For example, do students who are feeling a positive emotion keep their emotions to themselves or express them more than when feeling a negative emotion? This exploration would also help researchers develop strategies to help students during specific emotionally stimulating events (e.g., bullying, death of a loved one).

Future research may also wish to examine how long the effects of physical activity last. For example, do the benefits of physical activity provide a short or long-term effect, especially in relation to emotional regulation? Future researchers could also examine other aspects that may influence emotion regulation. For example, does participating in more social and team exercises (e.g., soccer, tag games) have a greater effect than participation in more individual activities (e.g., workout videos, jogging)?

Given the nature of the study, only two testing sessions were conducted. One testing session was held at the beginning of the academic year (September/October) and another at the end of the academic year (May/June). Providing an additional testing session mid-way through the academic year (i.e., January) may have added to the empirical evidence in support of the SPARK for Learning program. This additional session will help to see the effectiveness of the SPARK for Learning program and determine if changes have to be made.

These future research directions may help build upon the results of the present study and continue to broaden the emotion regulation and SPARK for Learning research. An increase in research focused on improving emotion regulation could help improve the daily lives for students who face challenges in this area. Further exploration may also assist researchers, practitioners, educators, policy-makers, and the general public in understanding how to support and help improve the emotion regulation of children and adolescents.

## **Conclusion**

The present study was the first step towards filling a gap in the literature by investigating emotion regulation in students with SLD. Specifically, the present study investigated the role of a daily physical activity program SPARK for Learning on emotion regulation and emotion regulation strategies for students with an SLD. Results indicate that although participating in SPARK for Learning alone was not beneficial for students, when examined in combination with student growth across time students' overall emotion regulation, and use of the expressive suppression strategy was impacted. The additional physical activity that the SPARK for Learning program as well as student growth may explain why the intervention affected both groups differently across time.

The present study expands the emotion regulation literature by exploring outcomes using physical activity. This expansion may help inform intervention programs focused on improving emotion regulation. The results of the present thesis open a new avenue for research in emotion regulation, specifically in students with SLDs. Future research in this area can help change how emotions are viewed and addressed with students who are likely to have emotional changes. By addressing the issue of emotion regulation, children with an SLD may have better control over their emotions, thus limiting the challenges they face on a daily basis.

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## Appendix A - Control Group Parent/Guardian Consent Form

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**Name of Researcher, Faculty, Department, Telephone & Email:**

**Additional Research Students:**

Juliana Bishop

**Title of Project:**

**Effects of Daily Physical Activity on the Learning, Behaviour, and Attention of Children**

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This consent form, a copy of which has been given to you, is only part of the process of informed consent. If you want more details about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

The University of Calgary Conjoint Faculties Research Ethics Board has approved this research study.

### **Purpose of the Study:**

The purpose of this research project is to investigate the therapeutic efficacy of twenty minutes of moderate to intensive exercise at a consistent target heart rate during the first period of the school day on the cognitive, academic, behavioural and social-emotional functioning of students. Recent research has suggested that moderate to intense exercise at a target heart rate for a given period of time results in improved brain functioning across a number of domains, including learning, memory, attention, mental health, and stress (Ratey, 2008). However, investigation of the impact of exercise on the school functioning of students has not yet been examined.

For this project, some children are participating in a physical activity program during the 2013-2014 school year while others are continuing their regular classroom programming. This divide is so that we can examine the changes in students involved in the physical activity program as compared to those who are not in the program. Your child will be remaining in their regular classroom programming and will continue to receive all the other supports offered by your school.

## What Will I Be Asked To Do?

If you choose to have your son/daughter participate in this research project, he/she will complete a number of tasks evaluating his or her cognitive, academic, and social emotional functioning. We will be working with children early in the school year (Sept-Oct 2013) and again at the end of the year (May-June 2014) to determine what changes may have occurred over the course of the year.

**It is important to note that all testing will be done at school during times that the classroom teacher deems to be appropriate.**

Some of the tasks that your child will complete involve having him/her solve problems, and others will involve asking him/her about how they think and behave. Most children find these tasks quite enjoyable. Your child will not be asked to do anything that is very difficult or that might make him/her feel uncomfortable. In addition to the researcher working with your child, your child's current teacher will be asked to complete two scales that ask about your child's academic performance as well as the teacher's views of his/her behaviour and functioning in the school setting.

Your child's participation in this study is wholly voluntary, and choosing to participate, not to participate, or withdraw from the research project will have no impact on your child, his/her continuing relationship with your school, or any services he/she may currently receive. If participants choose to withdraw from the research project, the data collected up to this point may be used in the current study, unless the participants request that their data be destroyed. Further, participants will be informed if any new information arises that may affect their decision to remain in the research project.

## What Type of Personal Information Will Be Collected?

If you choose to have your son/daughter participate in this research project, no access to personal information is required. Your child's name will not be identified at any time or associated with any results during the course of this research project. All students will be assigned a unique identification number which will be used to identify their information. No names will be recorded on assessment measures and all data will be kept confidential. However, you should be aware that other individuals (teachers, student) may be aware of your child's participation in the research project, as participation may occur during classroom time and teachers will know which specific children are participating in the research project. Of course, they will not have access to any of the results of your child's participation.

Only group information will be summarized for any publication or presentation of results and individual participants will not be identifiable. The names of the school, individual teachers, or students will not be identifiable; however, given the project's association the University of Calgary, it is possible to identify the city in which the research is being conducted.

## Are there Risks or Benefits if I Participate?

### Risks

If your child becomes visibly distressed as a result of participation in the research project, the researchers will enlist the assistance of a school counsellor to help address your son/daughter's needs. However, distress as a result of participation in this research project is unlikely.

As part of this research project, we will be collecting information about your child regarding their cognitive, social, and emotional functioning. Though unlikely, it is possible that we may learn information about your child that suggests that they require further assessment or intervention. **It is important to note that we do not provide diagnoses within this study.** However, should we believe that your child requires a formal assessment or other mental health support, we will provide you with information regarding the concerns raised. Additionally, we will encourage you to seek support through school or community resources.

In addition, we are required to report to the appropriate agencies suspicions of harm to a child or harm to another person. Should information be revealed that fits within this category, we will be required to pass this information on accordingly. It is important to note that only relevant information will be shared and no additional information about results within this research project will be revealed.

### Benefits

Some students experience difficulties with school success that go beyond those of most typical students, including problems with attention and focus, anxiety, memory difficulties, lack of engagement in learning, social difficulties, and other complex learning problems. Often, challenging life experiences compound their school difficulties. We are interested to examine whether a physical activity program may make a difference and give students a better chance of becoming successful, at learning and in life. All students who participate in the study, regardless of their group membership (i.e., involved or not involved with the physical activity program) will also have the benefit of making a contribution to knowledge that will potentially positively impact treatment for similar students, as well as for themselves. We want to thank you very much in advance for your help in furthering this research.

It is important to understand that you will not be provided with any specific results from the measures completed with your child, as these are for research purposes only. However, you will receive a summary report of research findings upon the study's completion.

## **What Happens to the Information I Provide?**

Participation in this study is completely voluntary and confidential. Only the researchers and research assistants will be allowed to see any specific results or questionnaires. Only group information will be summarized for any presentation or publication of results. All materials will be stored in a locked facility by one of the researchers. Data will be entered onto a password protected computer without your or your child's name attached, and thus all electronic files will remain anonymous. Your data will be stored for ten years in a locked cabinet and anonymously on a password protected computer, at which point it will be destroyed or permanently erased.



## ***Signatures (written consent)***

Your signature on this form indicates that you 1) understand to your satisfaction the information provided to you about your participation in this research project, and 2) agree to participate as a research subject.

In no way does this waive your legal rights nor release the investigators, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from this research project at any time. You should feel free to ask for clarification or new information throughout your participation.

Child's Name: (please print) \_\_\_\_\_

Parent's Name: (please print) \_\_\_\_\_

Parent's Signature \_\_\_\_\_ Date: \_\_\_\_\_

Researcher's Name: (please print) \_\_\_\_\_

Researcher's              Signature: \_\_\_\_\_ Date: \_\_\_\_\_

## **Questions/Concerns**

If you have any further questions or want clarification regarding this research and/or your participation, please contact:

If you have any concerns about the way you've been treated as a participant, please contact the Senior Ethics Resource Officer, Research Services Office, University of Calgary.

A copy of this consent form has been given to you to keep for your records and reference. The investigator has kept a copy of the consent form.

## Appendix B – Participating Group Parent/Guardian Consent Form

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**Name of Researcher, Faculty, Department, Telephone & Email:**

\_\_\_\_\_

**Additional Research Students:**

Juliana Bishop

**Title of Project:**

**Effects of Daily Physical Activity on the Learning, Behaviour, and Attention of Children**

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This consent form, a copy of which has been given to you, is only part of the process of informed consent. If you want more details about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

The University of Calgary Conjoint Faculties Research Ethics Board has approved this research study.

### **Purpose of the Study:**

The purpose of this research project is to investigate the therapeutic efficacy of twenty minutes of moderate to intensive exercise at a consistent target heart rate during the first period of the school day on the cognitive, academic, behavioural and social-emotional functioning of students.

Recent research has suggested that moderate to intense exercise at a target heart rate for a given period of time results in improved brain functioning across a number of domains, including learning, memory, attention, mental health, and stress (Ratey, 2008). However, investigation of the impact of exercise on the school functioning of students has not yet been examined. Your son/daughter has been invited to participate in this research project because his/her class participates in the “SPARK for Learning” program every morning.

## What Will I Be Asked To Do?

If you choose to have your son/daughter participate in this research project, he/she will complete a number of tasks evaluating his or her cognitive, academic, and social emotional functioning. We will be testing children early in the school year (Sept-Oct 2013) to get an understanding of their abilities before engaging in the “SPARK for Learning” program over the course of the year. Additionally, we will retest children at the end of the year (May-June 2014) in order to determine what progress the children have made as a result of participating in this program. It should be noted that all children in your child’s class will be participating in the “SPARK for Learning” program as part of their educational program; however, only those students whose parents have provided consent will participate in the research component of this program. Those students not taking part in specific research activities will not lose any educational opportunities as a result of non-participation.

**It is important to note that all testing will be done at school during times that the classroom teacher deems to be appropriate.**

Some of the tasks that your child will complete involve having him/her solve problems, and others will involve asking him/her about how they think and behave. Most children find these tasks quite enjoyable. Your child will not be asked to do anything that is very difficult or that might make him/her feel uncomfortable. In addition to the researcher working with your child, your child’s current teacher will be asked to complete two scales that ask about your child’s academic performance as well as the teacher’s views of his/her behaviour and functioning in the school setting.

Your child’s participation in this study is wholly voluntary, and choosing to participate, not to participate, or withdraw from the research project will have no impact on your child, his/her continuing relationship with your school, or any services he/she may currently receive. If participants choose to withdraw from the research project, the data collected up to this point may be used in the current study, unless the participants request that their data be destroyed. Further, participants will be informed if any new information arises that may affect their decision to remain in the research project.

## What Type of Personal Information Will Be Collected?

If you choose to have your son/daughter participate in this research project, no access to personal information is required, other than confirming that your child has learning and/or attentional issues as identified by their student file. Your child’s name will not be identified at any time or associated with any results during the course of this research project. All students will be assigned a unique identification

number which will be used to identify their information. No names will be recorded on assessment measures and all data will be kept confidential. However, you should be aware that other individuals (teachers, student) may be aware of your child's participation in the research project, as participation may occur during classroom time and teachers will know which specific children are participating in the research project. Of course, they will not have access to any of the results of your child's participation.

Only group information will be summarized for any publication or presentation of results and individual participants will not be identifiable. The names of the school, individual teachers, or students will not be identifiable; however, given the project's association the University of Calgary, it is possible to identify the city in which the research is being conducted.

## Are there Risks or Benefits if I Participate?

### Risks

If your child becomes visibly distressed as a result of participation in the research project, the researchers will enlist the assistance of a school counsellor to help address your son/daughter's needs.

As part of this research project, we will be collecting information about your child regarding their cognitive, social, and emotional functioning. Though unlikely, it is possible that we may learn information about your child that suggests that they require further assessment or intervention. **It is important to note that we do not provide diagnoses within this study.** However, should we believe that your child requires a formal assessment or other mental health support, we will provide you with information regarding the concerns raised. Additionally, we will encourage you to seek support through school or district resources.

In addition, we are required to report to the appropriate agencies suspicions of harm to a child or harm to another person. Should information be revealed that fits within this category, we will be required to pass this information on accordingly. It is important to note that only relevant information will be shared and no additional information about results within this research project will be revealed.

### Benefits

Some students experience difficulties with school success that go beyond those of most typical students, including problems with attention and focus, anxiety, memory difficulties, lack of engagement in learning, social difficulties, and other complex learning problems. Often, challenging life experiences compound their school difficulties. We believe that the "SPARK for Learning" project can make a difference and give students a better chance of becoming successful, at learning and in life. Students who participate in the study will also have the benefit of making a contribution to knowledge that will potentially positively impact treatment for similar students, as well as for themselves. We want to thank you very much in advance for your help in furthering this research.

It is important to understand that you will not be provided with any specific results from the measures completed with your child, as these are for research purposes only. However, you will receive a summary report of research findings upon the study's completion.

## **What Happens to the Information I Provide?**

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Parent's Name: (please print) \_\_\_\_\_

Parent's Signature \_\_\_\_\_ Date: \_\_\_\_\_

Researcher's Name: (please print) \_\_\_\_\_

Researcher's      Signature: \_\_\_\_\_ Date: \_\_\_\_\_

## **Questions/Concerns**

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A copy of this consent form has been given to you to keep for your records and reference. The investigator has kept a copy of the consent form.