

First Friends - A Social-Emotional Preventive Intervention Program:  
The Mediation Role of Inhibitory Control

by

Katherine Dale Randall

B.Sc. University of Northern British Columbia, 2003

M.A., University of Victoria, 2005

A Dissertation Submitted in Partial Fulfillment of the  
Requirements for the Degree of  
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Supervisory Committee

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Dr. Ulrich Mueller, Department of Psychology  
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Dr. Wanda Boyer, Department of Educational Psychology and Leadership Studies  
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## Abstract

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The purpose of this study was to implement and assess the efficacy of a novel social skills intervention (First Friends; Graham, 2000, 2006) on improving social cognitive skills, social behaviours, and executive functions in an early childhood population of children from socioeconomically disadvantaged areas. Early school years are a critical developmental period to intervene to facilitate social competency and reduce problem behaviours. Children from socio-economically disadvantaged backgrounds are at-risk as many suffer from behavioural problems and begin school without the social maturity and behavioural regulation skills needed to succeed in an academic environment. First Friends is an 8-week preventive intervention designed to promote critical areas of social-emotional development including problem solving, conflict resolution, planning, identification of emotions, empathy, assertiveness, anger management, verbal communication, creativity and cooperation. In addition to examining intervention effects, another goal for this study was to examine the mediational role of improvements in different latent EF components (i.e., working memory, inhibition, set-shifting/mental flexibility) on intervention outcomes. Executive functions (EF) have been linked to social-emotional competence. The First Friends program teaches social

skills that are suggested to require EF to learn, as well as implement, during social interactions. The social skills taught and practiced also utilize overlapping brain pathways. Therefore, the First Friends intervention was hypothesized to impact both social-emotional functions and EF, given that 1) EF appears to be required in learning and developing several social and emotional skills, and 2) brain pathways utilized in carrying out these functions overlap.

Eighty-seven kindergarten children (41 controls,  $M = 5.42$  years; 46 intervention,  $M = 5.40$  years) from socio-economically disadvantaged areas of the Greater Victoria region in B.C. participated in this study. Children's EF and social-emotional and social-cognitive skills were assessed and their social skills and behaviours were rated by parents, teachers, and observers before and after the intervention. Results provided support for the efficacy of the intervention with children who participated in the intervention demonstrating significantly stronger socio-emotional and social cognitive abilities, more prosocial behaviours, and less negative behaviours compared to a control group. Parent and teacher reports did not reveal significant changes. In addition, significant intervention effects on working memory and set-shifting/mental flexibility were found. Contrary to hypotheses, intervention effects were not revealed for inhibition. In addition, none of the EF latent constructs were found to mediate intervention outcomes.

Overall, the First Friends program shows promise with regard to improving both social and executive functioning skills, and continued research and implementation with this program is warranted. These findings highlight the importance of not only assessing for social outcomes, but also examining the development of other cognitive processes

that appear to be involved in social development. The results of this study can facilitate understanding of the scope of social intervention outcomes on cognitive processes and guide the selection and implementation of effective prevention programs with early childhood populations in the future.

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## Dedication

Thank you to my loving partner and best friend Kent. Your strength, support, and love helped me all along the way.

Thank you also to my family and friends, for always believing in me, and supporting me when I needed you.

## Introduction

The objective of the current study is to examine the efficacy of a novel social skills intervention on improving social-emotional competency and executive functions. In addition, the current study examines the meditational role of executive functioning to social-emotional outcomes. The following introductory pages provide information on the importance of social skills in early childhood, highlighting the value of targeting improving social skills in children with socio-economically disadvantaged backgrounds. In addition, research linking executive functioning to social development and competency is reviewed, with the goal of highlighting how interventions targeting social skills can also impact the development of executive functioning through direct and indirect routes. The current research examining the role of executive functions in social intervention studies is also discussed, along with a method of examining executive functions more effectively within this research. Lastly, study objectives and hypotheses will be outlined, illustrating the study design and importance of the current research to the burgeoning field of social-emotional intervention literature.

### *The Importance of Social Skills in Early Childhood*

The kindergarten and pre-school years are a pivotal developmental time for children in which they must acquire social awareness and skills in order to succeed in the social and academic world of the school system. Children enter into kindergarten with a broad range of experiences and from different backgrounds and encounter dramatic changes with regard to the goals, demands, and evaluative components involved in school. Experiences that precede the entrance into the structured, formalized world of

kindergarten instruction lead to a wide range of responses to school transition and can pose significant challenges without the proper protective factors in place (Rimm-Kaufman, Pianta, & Cox, 2000). For example, higher cognitive competencies, more comprehensive preschool experience, greater social competency, and better quality of the home environment such as higher socioeconomic status, less harsh discipline strategies, and greater maternal warmth, have been shown to be predictors of greater school performance and easier adjustment to school (see Rimm-Kaufman et al., 2000 for details).

The social, emotional, and behavioural adjustment of children in early school years has been shown to be as important to school success as cognitive and academic readiness (Raver & Zigler, 1997). Children with problems paying attention, following instructions, cooperating with others, and controlling their negative emotions perform more poorly in school (Ladd, Kochenderfer, & Coleman, 1997), are more likely to be rejected by peers, and receive less positive feedback from teachers, all of which contributes to off-task behaviours and reduced instruction time (Shores & Wehby, 1999).

Furthermore, peer acceptance and popularity during the early school years (i.e., kindergarten) have been related to higher achievement and IQ. Early positive peer relationships have been shown to predict later social competence, achievement, job competence, extra-curricular activities, self-worth, and better mental health, whereas difficulties with peers predict later maladjustment (see Masten & Coatsworth, 1998, for a review). There is also evidence that peer rejection leads to decline in classroom participation and lower rates of achievement in childhood (Buhs, Ladd, & Herald, 2006).

Having good peer relationships can serve a protective role in kindergarten development, as research has shown that having friends is associated with positive attitude changes towards school and peers and easier adaptation to kindergarten (Ladd, 1990; Ladd, Kochenderfer, & Coleman, 1996). Research on social competence, psychopathology, and resilience all highlight the importance of establishing a good start early in development (Masten & Coatsworth, 1998), which involves the kindergarten years. For example, research with kindergarten children has shown that prosocial behaviours displayed early in kindergarten are linked to a greater number of mutual friendships and higher acceptance among peers, which relates to more adaptive classroom participation, and higher levels of achievement (Ladd, Birch, & Buhs, 1999). Likewise, kindergarten children who demonstrate anti-social behaviours, or behaviours that lack the consideration of others (e.g., aggression, bullying) tend to have fewer mutual friendships, lower levels of peer acceptance, and more negative teacher-child relationships (Ladd et al., 1999).

#### *Children from Socio-Economically Disadvantaged Backgrounds*

Children from socio-economically disadvantaged backgrounds are at a particular risk in school, with as many as 25 percent of these children exhibiting behavioural problems (Rimm-Kaufman et al., 2000; Webster-Stratton, 1998; Webster-Stratton, Reid, & Hammond, 2001). Explanations for these risk factors highlight how children are socialized in the home. For example, low socio-economic status (SES) is related to increased marital conflict, harsher discipline strategies, and less maternal warmth (Conger, Conger, Elder, Lorenze, Simons, & Whitbeck, 1992). Children who live in environments with higher levels of poverty are at greater risk of experiencing day-to-day

stressors (McLoyd, 1998), and are less prepared for the transition to school. Low income also seems to be related to greater levels of fear, irritability, and lower emotional control in children (Lengua, 2006). Research has indicated that communities with higher poverty rates typically implement fewer and less intensive practices that aid in the transition to kindergarten than communities with lower poverty concentrations, demonstrating a link between high poverty concentrations and risk (Pianta, Cox, Taylor, & Early, 1999).

Research has also shown that children from low SES families are at a greater risk of experiencing social exclusion from social and school activities and are significantly less likely to see their friends outside of school than children from middle and high SES families (see Davies, Davis, Cook, & Waters, 2008). Many of these children will also begin school without the social and emotional maturity and classroom behaviours that enable them to learn, thus impeding their progress in school and their success in academics and employment in later life (Campbell & von Stauffenberg, 2008; McClelland, Acock, & Morrison, 2006; Ryan, Fauth, & Brooks-Gunn, 2006).

Emotional and behavioural problems in early childhood may interfere with the acquisition of age-appropriate abilities and negatively impact developmental trajectories (Patterson & Stoolmiller, 1991). Indeed, social-emotional competence can be viewed as an important protective factor during early childhood, serving to buffer young children from stressors and contribute to the prevention of development of emotional and behavioural difficulties (Garmezy, 1991). Research has suggested that the preschool/kindergarten years (ages 4-6) are critical for building social-emotional competence (Masten & Coatsworth, 1998). Therefore, the early school years represent an optimal period to intervene directly with children and facilitate social-emotional

competency, strengthen resilience, and reduce externalizing and internalizing behaviours before these problematic behaviours develop into permanent patterns and lead to damaging reputations within an academic setting (Webster-Stratton & Reid, 2004).

### *Intervening During Early Childhood*

Research has highlighted the importance of promoting social development and self-regulation in early childhood intervention programs as a way to advance the cooperation, motivation, and focused persistence required for academic and social success in school (Denham & Burton, 2003; McClelland et al., 2006; Normandeau & Guay, 1998; Shonkoff & Phillips, 2000). There are several ways to intervene and support children to succeed in social and academic arenas. One way is to work with parents directly and provide them with positive parenting strategies. Another is to train teachers in classroom management strategies to promote social competence. A third approach is to train children directly in social, cognitive, and emotional management skills such as friendly communication, problem solving, empathy, anger management, and conflict resolution. The direct training approach is supported by the extensive literature that indicates that children who suffer from behavioural problems also demonstrate social and cognitive deficits (Coie & Dodge, 1998).

Training children in social and emotional competence, especially those at risk due to biological or temperamental factors, or socio-economic and stressful life factors, can lead to decreases in aggressive behaviour, greater inclusion with prosocial peers, and improved academic success (Webster-Stratton & Reid, 2004). It is important to note that because the acquisition of these social and emotional competencies is not automatic, especially for at-risk children, more explicit and intentional teaching is necessary

(Bredekamp & Copple, 1997). In addition, interventions that provide direct educational experiences for children have shown larger and longer lasting benefits compared to programs that rely solely on indirect or intermediary approaches such as parent training to enhance children's intellectual and social experiences (e.g., Casto & Lewis, 1984; Madden, Levenstein, & Levenstein, 1976; Scarr & McCartney, 1988; Wasik, Ramey, Bryant, & Sparting, 1990; see Ramey & Ramey, 1998, for a review). For example, Wasik and colleagues (1990) assessed the value of longitudinal direct versus intermediary forms of early intervention with an economically disadvantaged, high-risk early childhood sample. They found that combining daily center-based intervention with weekly parent-oriented home visits resulted in significant cognitive gains for the children. In contrast, a weekly home visit (intermediary) program sustained over five years had no measurable benefits on children's cognitive or social performance, parent attitudes or behaviour, or the quality of the home environment (Wasik et al., 1990).

The option of directly training children is also conceptually the most viable. Training teachers in novel school-based curricula involving social skills or teaching social skill development strategies is not always feasible, nor are teachers necessarily supported or expected within a teaching role to provide each child with the individual attention and the social skills teaching required. Likewise, parents may not be open or accessible to learning new parenting strategies and teaching their children social skills. So, although the involvement of parents and teachers within any intervention is certainly ideal, it is not always feasible, and identifying other more practical means to train children in these important skills is essential.

There has been a notable increase in the number of prevention programs targeting social and emotional development in previous decades with a goal of decreasing the risk of behavioural problems and mental health issues (Drug Strategies, 1998; Greenberg, Domitrovich, & Bumbarger, 1999). These programs endeavour to promote competencies in a variety of areas (e.g., inhibition of impulsive behaviour, awareness and regulation of emotions, accurate perception of others perspectives, problem identification, and positive problem solving) (Zins, Elias, Greenberg, & Weissberg, 2000) with the hope that these skills enable children to better navigate through developmentally appropriate social situations and tasks (Weissberg, Caplan, & Sivo, 1989). Children who are fully capable of manoeuvring through, and engaging in, such social tasks are generally considered both socially and emotionally competent.

An important consideration when designing and implementing any social intervention is the characteristics of the children that will allow them to be most receptive and engaged in the learning processes involved in a particular intervention. There are many factors that can influence social development such as genetics, culture, gender, temperament, social interactions, intellectual functioning, neurological dysfunction, socioeconomic status, parental unemployment, parental conflict, parent mental health, parent education, parenting behaviours, and parent-child relationships (see Yeates, Bigler, Dennis, Gerhardt, Rubin, et al., 2007, for a review). Temperament is defined as individual variations in emotional, behavioural, and attentional reactivity and self-regulation, which appear early in life, remain relatively stable across time, and form the groundwork for personality development (Berger, Kofman, Livneh, & Henik, 2007; Eisenberg, Fabes, Shepard, Murphy, Guthrie, et al., 1997; Lemerise & Arsenio, 2000).

Research has found links between temperament and individual differences in adaptation in children, prosocial behaviours, social adjustment, and the active regulation of emotion (see Zeidner et al., 2003 for a review).

The developmental level of the children must also be taken into account when designing social interventions. Interventions must be prepared at a level at which the children will be capable of processing and utilizing the information and strategies provided. Specifically, although most social, emotional, and cognitive skills emerge during early childhood, substantial development must occur before these skills are fully functional (Anderson, 2002). Skill development can be divided into three stages (Dennis, 1989): 1) emerging skills, which are in the early but not yet functional stage of acquisition, 2) developing skills, where the capacity is partially acquired but not fully functional and 3) established skills, which are fully developed and mature. Importantly, only developing and established skills that are functional can be properly assessed. The current study aimed to implement an age-appropriate social-emotional intervention designed to target children in the early school years (i.e., preschool and kindergarten). Children's developing skills were also assessed in an age-appropriate format.

Advances in our understanding of brain development have highlighted the importance of early childhood interventions. During the ages of 3 through 10, the brain is more densely connected than at any other time in a child's life. The literature is clear on the importance of early experiences in influencing the growth and development of neural pathways (Kotaluk, 1996). Specifically, neural connections that receive stimulation through experiences are reinforced, and those that are left un-stimulated tend to be eliminated or pruned. Therefore, the human brain is constructed to be efficient at

acquiring a large number of skills early in development, and disposing of unused neural connections. Learning can certainly occur after this period, but remediation becomes more difficult once the dense neural network of connections present during early life decreases (Shonkoff & Meisels, 2000). This follows the principal of developmental timing, where intervening during the period when skill acquisition occurs can afford greater benefits (Ramey & Ramey, 1998). A lack of early intervention during this significant period of growth and development may leave some children at risk for missing important opportunities to acquire social, emotional, and cognitive skills. The greatest period of functional development of abilities mediated by the frontal lobes (i.e., EF) occurs during childhood, with rapid advances during early childhood, moderate increases during later childhood, and a slower, more protracted developmental period until mature, adult performance levels are achieved between adolescence and early adulthood (see Romine & Reynolds, 2005 for a review). On the basis of these findings, implementing preventive intervention programs during early and middle childhood while these important skills are developing may be more beneficial in promoting supportive neurocognitive functioning and healthy behavioural development than programs implemented later in life.

### *Executive Functioning*

Executive functioning (EF) is emerging during the kindergarten years, and the development of these cognitive abilities overlaps with the developmental trajectory of social and emotional skills. EF is a complex construct with multiple components involved in the deliberate or goal-directed control of behaviour. EF refers to a number of cognitive processes such as the planning and implementation of performance strategies, the

initiation and discontinuation of behaviours or actions, the inhibition of habitual responses or distracting information, monitoring of one's performance, sustained attention, working memory, and set switching (Castellanos, Sonuga-Barke, Milham, & Tannock, 2006). EF skills are reliant on the frontal systems of the brain.

The early childhood years represent a period of rapid development in executive skills. EF enable children to flexibly organize their thinking and behaviour, decrease their reactive responding to external stimuli, and engage in self-regulated and rule-governed behaviour (Barkley, 2001). EF skills developing during this time are inhibitory control (Diamond & Taylor, 1996; Gerstadt, Hong, & Diamond, 1994; Jones, Rothbart, & Posner, 2003; Kirkham, Cruess, & Diamond, 2003), selective attention (Humphrey, 1982), set-shifting (Towse, Redbond, Houston-Price, & Cook, 2000), planning (Hudson, Shapiro, & Sosa, 1995), and working memory (Espy, Kaufmann, McDiarmid, & Glisky, 1999).

Child-friendly EF tasks have become more available, which has led to significant improvements in our understanding of the development of EF (Hughes & Ensor, 2011). Recent research has provided support of the idea that EF is a unitary construct that consists of partially dissociable components (Garon, Bryson, & Smith, 2008; Miyake, Friedman, Emerson, Witzki, Howerter, & Wager, 2000). These partially dissociable components have been identified as working memory, inhibitory control, and mental flexibility or set-shifting. These EF components begin to emerge during the first few years of life (Diamond, 1991).

Garon and colleagues (2008) proposed that EF components emerge in sequence over early childhood. Working memory, or the capacity to hold information in mind and

update and manipulate that information, was proposed as the first skill to develop, with rudimentary forms evident in the first 6 months of life and more complex forms apparent at 15 months (Garon et al., 2008). Response inhibition, which requires cognitive control over behaviour, such as delaying responses, and reducing conflict between dominant and subdominant responses, was proposed as the next to develop, with rudimentary skills evident within the latter half of the first year of life (Garon et al., 2008). Working memory and inhibition were proposed to coordinate around 2 years of age to enable the development of set-shifting (Garon et al., 2008). Set-shifting or mental flexibility requires children to flexibly shift between tasks or mental sets. Set-shifting requires holding an original rule in memory and acting on this rule (working memory), then inhibiting this previous rule, and flexibly switching to a different rule.

### *Analysis of EF*

A common problem arises in EF research as the manifestation of EF components invariably involves other (non-EF) cognitive processes (Huzinga, Dolan, & van der Molen, 2006). By definition, EF is a tertiary process that regulates other cognitive abilities such as language, visual-spatial, motor, and memory skills (Wiebe, Sheffield, Nelson, Clark, Chevalier, & Espy, 2011). Therefore, individual differences on EF tasks can be attributed to variations in EF proficiency and/or variation in these other non-executive abilities that are required to complete the EF task (Weibe et al., 2011). This issue is referred to as the “task impurity” problem (Miyake et al., 2000), in that operationalizing any construct using only a single indicator can rarely be viewed as an accurate or pure measure of that construct. Most measures are contaminated by random and systematic error (Kline, 1998), and in the case of EF tasks, also other cognitive

processes (Miyake et al., 2000). Early childhood is characterized by significant variation in the acquisition of these non-executive skills. The potential confounding influence of variability in non-executive skills on EF measurement is of particular concern and needs to be addressed in studies examining EF during the early childhood years (Wiebe et al., 2011).

Fortunately, the effects of measurement error and confounding non-executive influences can be partitioned out statistically. This can be done using multiple tasks to measure each EF component and adopting a latent variables approach to extract the variance common to those tasks (Huzinga et al., 2006). Latent variables refer to what is shared among tasks that are believed to measure a specific EF. The latent variable approach minimizes the task impurity problem and is therefore especially informative in studies of EF in early childhood (Huzinga et al., 2006). The technique of latent variable modelling has become more accessible in recent years, and as a result, researchers are increasingly conducting confirmatory factor analyses to test different models of EF development (Hughes & Ensor, 2011).

The confirmatory factor analysis (CFA) approach utilizes a battery of tasks that are assumed to tap a given EF. Task performance scores are then modeled as indicators of a specific latent EF construct, which represents a “purified” EF measure (Wiebe et al., 2011). Studies have used this approach successfully in adulthood (Friedman & Miyake, 2004; Miyake et al., 2000) adolescence (Friedman, Haberstick, Willcutt, Miyake, Young, Corley, et al., 2007; Friedman, Miyake, Young, DeFries, Corley, & Hewitt, 2008) and childhood (Huizinga et al., 2006; Lehto, Juujarvi, Kooistra, & Pulkkinen, 2003; St. Clair-Thompson & Gathercole, 2006; van der Sluis, de Jong, & van der Leij, 2007). Although

the structure of EF from middle childhood through to adulthood appears to reflect an EF structure that includes distinct, but interrelated factors, a flurry of recent studies suggests that the EF structure in early childhood may be one of unity. More specifically, studies in early childhood populations of children ranging from ages 3 through 6 years have shown that a one-factor model fits the data best (e.g., Hughes, Ensor, Wilson, & Graham, 2010; Hughes & Ensor, 2011; Wiebe, Espy, & Charak, 2008; Wiebe et al., 2011). Other researchers have found support for non-unitary models (Miller et al, 2012). Although developmental models of EF are still actively being researched, it should be noted that across multiple studies, the diversity of EF is broadly acknowledged (Wiebe et al., 2011). Specifically, studies using CFA in school-aged children, adolescents, and adults have shown that the best fitting model is one that includes the three distinct, but strongly correlated, EF factors: working memory, set-shifting, and inhibition (Friedman et al., 2007; Friedman et al., 2008; Lehto, Juujarvi, Kooistra, & Pulkkinen, 2003; Miyake et al., 2000).

The current study utilized the latent factors approach to estimate three core EF components (working memory, response inhibition, and set shifting) in an effort to clarify how these specific EF skills are: 1) affected by a novel social skills intervention, First Friends (Graham, 2000; 2006), and 2) how these individual EF latent factors contribute to outcomes of the First Friends social preventive-intervention. A non-unitary EF structure was utilized in order to more specifically examine the role of each EF construct in the social skills intervention. To the author's knowledge, no social skills intervention study to date has utilized a latent factors approach in examining the role of different EF components in social interventions. The research summarized above clearly illustrates the

importance of using a latent factors approach in order to more accurately assess EF, particularly in early childhood populations.

#### *The relationship between EF and social-emotional competence*

Many of the cognitive EF skills (i.e., inhibition, working memory, set-shifting) seem to overlap with social-emotional skills such as problem solving and inhibiting inappropriate behaviours. For example, EF skills such as the capacity to inhibit a prepotent response and choose an alternative response improve during early childhood (Archibald & Kerns, 1999), allowing children to better regulate their emotions, which in turn motivate and inform their exploration of their social worlds (Derryberry & Rothbart, 1997; Kochanska, Murray, & Harlan, 2000).

EFs, including attentional control, are critical to the development of self-regulation. Children with the capacity to inhibit inappropriate behaviours, delay gratification, and use cognitive methods to control their emotions and behaviours tend to be more socially competent overall, liked by their peers, and well-adjusted (Berger et al., 2007 for a review).

#### Brain regions involved in EF and social functioning

Brain areas involved in social-cognitive and emotional functioning often overlap and are also implicated in cognitive executive functions (Yeates et al., 2007). For example, the orbitofrontal cortex, which begins to mature in the second year of life (Happaney, Zelazo, & Stuss, 2004), has been implicated in the reappraisal of the motivational significance of stimuli based on response-reward contingencies (i.e., decision making based on reward consequences), social reasoning and decision making,

self-regulation, and the emotional aspects of empathy, which include emotional responsiveness and sensitivity to the affective states of others (Happaney et al., 2004; Eslinger, 1998).

The dorsolateral prefrontal cortex (DL-PFC) matures last, up to the age of 25, coinciding with its later myelination (Gogtay, Giedd, Lusk, Hayashi, Greenstein, et al., 2004; Singer, 2006; Yeates et al., 2007). The DL-PFC is involved with cognitive executive functions, working memory, and the cognitively based aspects of empathy that require interpersonal understanding and mentalizing (Eslinger, 1998).

The ability to take the perspective of another person and predict the behaviours of others, termed theory of mind (TOM), has been shown to involve the dorsal medial prefrontal cortex in preschoolers (Sabbagh, Bowman, Evraire, & Ito, 2009). The medial frontal cortex is linked to action/behaviour monitoring to ensure that behaviours and actions are consistent with intentions and fit the current social context (Amodio & Frith, 2006), emotional regulation, emotional responses to socially relevant stimuli, and monitoring of outcomes associated with punishment and reward.

The cingulate cortex is involved with modulation of cognition, error monitoring, emotion processing, and TOM. The hippocampus and temporal poles are associated with the modulation of cognition, memory for personal experiences, and the retrieval of emotional memories. The ventral striatum is involved in motivational evaluation, self-regulation, and linking internal somatic states and external stimuli. The amygdala is implicated in motivational evaluation, self-regulation, emotional processing, gaze discrimination, as well as linking internal somatic states and external stimuli (see Yeates et al., 2007, for a review). Important to note is that the relationship between structure and

process is not one-to-one due to the multidirectional and recursive nature of connections. As can be inferred from the above, individual processes depend on a number of structures, and a single brain structure can be involved in several neural processes (Adolphs, 2003).

Given the links between brain structures and EF and social functions, it comes as no surprise that several of the skills targeted by social-emotional interventions are thought to depend on overlapping neurocognitive constructs (Riggs & Greenberg, 2004). The current study utilized the First Friends preventive intervention (Graham, 2000, 2006), which promotes several social skill competencies including empathy, emotional and behavioural regulation, planning and problem solving, that are dependent upon prefrontal cortex functioning. Interventions that serve to promote social skills are hypothesized to utilize brain regions and pathways that overlap with those involving EF and should strengthen and improve both social skills and EF functions.

#### Research linking EF to social competence

In addition to research indicating links between brain structures involved in social-affective and cognitive-executive processes, EF have also been directly associated with the development of social-emotional functioning. Relationships between social-emotional development and EF have been found in childhood (Cole, Usher, & Cargo, 1993; Hughes, White, Sharp, & Dunn, 2000; Jahromi & Stifter, 2008; Speltz, DeKlyen, Calderon, Greenberg, & Fisher, 1999).

Research has also found links between EF and problem behaviours. For example, problems with EF tasks in preschoolers have been positively correlated with disruptive behaviours (Cole et al., 1993; Speltz et al., 1999), poor emotion regulation, and difficulty

controlling impulsive behaviours (Jahromi & Stifter, 2008). Research has found corresponding difficulties in EF and social-emotional functioning such as impulsivity, distractibility, delay of gratification, problems concentrating, selecting actions, understanding mental states, and recognizing action consequences (Hughes, 2002; Kusché, Cook & Greenberg, 1993; Morgan & Lilienfeld, 2000; Pennington, 2002; Stuss & Benson, 1984). A recent study (Hughes & Ensor, 2011) with children ages 4 and 6 found that changes in EF were predictive of emotional symptoms, hyperactivity, and conduct/peer problems.

Longitudinal studies in early childhood have found inhibitory control and sequencing abilities to predict externalizing and internalizing behaviours and social competency two years later (Nigg, Quamma, Greenberg, & Kusché, 1998; Riggs, Blair, & Greenberg, 2003). In children age 5, executive inhibition and behavioural inhibition to the unfamiliar, or a tendency to withdraw when faced with novel situations, have been found to be negatively related to problematic, non-clinical hyperactivity in school 3 years later (Thorell, Bohlin, & Rydell, 2004). In longitudinal studies, a relationship between EF and social-emotional development has also been found (Brophy, Taylor, & Hughes, 2002; Hughes, Cutting, & Dunn, 2001; Hughes & Ensor, 2008; Hughes, White, Sharpen, & Dunn, 2000) linking early EF difficulties to later negative behaviours and early problem behaviours to later rule violations and perseverative errors.

Self-control or regulation requires effortful control and is an important aspect in the development of children's social and emotional functioning. Effortful control is the capacity to engage voluntary control systems in order to suppress dominant responses in favour of subdominant responses (Derryberry & Rothbart, 1997; Posner & Rothbart,

2000). Effortful control is a higher order factor that allows a person to regulate their behaviour in agreement with cultural norms (Posner & Rothbart, 2009). Effortful control is influenced by a combination of genetics and parental socialization and is a key component of children's emotional, cognitive, and social development (Posner, Rothbart, & Gerardi-Caulton, 2001). One form of self-control is the ability to delay gratification, which refers to the capacity to resist immediate but less desirable gratification for a later, more desirable, reward or outcome, and may be related to the ability to resist temptation and regulate frustration and stress (Mischel, Shoda, & Rodriguez, 1989; Sethi, Mischel, Aber, Shoda, & Rodriguez, 2000). The ability to delay gratification with regards to prudence involves getting a small reward now or waiting for a larger reward. The ability to delay gratification with altruism involves getting a reward now, or waiting and getting a reward for self and other. These abilities develop between the ages of 3 and 5. Specifically, 4-5 year olds demonstrate significantly better prudence and altruism than 3 year olds (Moore, Barresi, & Thompson, 1998). Several researchers have supported a connection between EF and the ability for children to delay gratification. For example, EF abilities such as planning and inhibiting responses and controlling attention deployment have been suggested to directly influence the ability to control behaviours in social situations, such as delaying gratification (Peake, Hebl, & Mischel, 2002). Furthermore, associations have been found between performance on EF tasks and delayed gratification tasks (e.g., Carlson & Moses, 2001; Jahromi & Stifter, 2008). For example, a recent study found that the ability to delay gratification was specifically related to the ability to inhibit prepotent responses (Jahromi & Stifter, 2008). Carlson, Moses, and Breton (2002) distinguish between conflict inhibition, which requires the

ability to inhibit prepotent responses and activate a conflicting novel response, and delay inhibition, which requires children to inhibit responding, as required for delay of gratification tasks.

In addition to delay of gratification, effortful control has also been found to have a positive correlation with empathy, perhaps through allowing an individual to attend to another's thoughts and feelings without being distracted by their own internal affective experience (Rothbart, Ahadi, & Hershey, 1994). Developmental associations have also been found between effortful control and the development of conscience (Kochanska, Murray, Jacques, Koenig, & Vandegeest, 1996). Kochanska and Aksan (2006) view conscience as an inner self-regulatory system involving emotional, executive, and cognitive mechanisms. Effortful control, fearfulness, parental discipline, and the parent-child relationship have been shown to predict differences in young children's conscience (see Kochanska & Aksan, 2006, for a review).

Theory of mind (TOM), the awareness, understanding, and ability to take the perspective of another person and predict the behaviours of others (Amodio & Frith, 2006), is a key component to social-emotional competency. Carpendale and Lewis (2004) outline that a child does not simply adopt socially available knowledge, but that an understanding of mental states develops and is constituted within social interactions. In addition, a review by Hughes and Leekam (2004) outlined that TOM skills both influence, and are influenced by, interpersonal and family relationships and language.

TOM is often assessed using false belief tasks. False belief tasks involve examining if children can attribute a false belief to someone else. There are numerous variations of false belief tasks based on the original task designed by Wimmer and Perner

(1983). In this original false believe task, children see a scene in which a character, Maxi, puts chocolate in a drawer and then goes away. While Maxi is away, his mother takes a bit of this chocolate for cooking and then puts the rest somewhere else and goes out. Then Maxi comes back, and the child is asked to identify where Maxi will look for the chocolate. In order to complete the task correctly, the child must be able to understand that another's mental representation of the situation (Maxi's in this situation) is different from their own, and the child must be able to predict behaviour based on that understanding.

Research is accumulating to suggest that EF and TOM are linked together in development with a moderate to robust relationship that is independent from age, verbal ability, and individual differences in general ability (Carlson & Moses, 2001; Hughes, 1998b, 2002; McGlamery, Ball, Henley, & Besozzi, 2007; Moses & Tahiroglu, 2010). In order to be successful on many TOM tasks, such as intentional deception and false belief tasks, EF skills such as mental flexibility, inhibition, working memory, and strategic planning seem to be required (Carlson & Moses, 2001; Frye, Zelazo, & Palfai, 1995; Hughes, 1998a,b). For example, on false belief tasks, two perspectives must be held in mind (working memory) while inhibiting one's own dominant perspective (inhibitory control) (Moses & Tahiroglu, 2010). Furthermore, inhibitory control and TOM share a similar developmental time-frame, with both abilities developing between the ages of two and five. Longitudinal studies have supported a link between EF capacity and later TOM skills. For example, a recent study found that preschool children (aged 4.5 years) who performed better on tasks of EF had higher scores on false belief tasks one year later (age 5.5 years) (Jahromi & Stifter, 2008). Several other studies have also found early EF skills

to be related to TOM ability later on in childhood (Carlson, Mandell, & Williams, 2004; Flynn, O'Malley, & Wood, 2004; Hughes, 1998b), and support the theory that EF is a precursor to TOM.

In summary, there is a burgeoning literature that supports relationships between children's EF and their social-emotional development. Given the evidence linking EF and social skills development, the current study was carried out with the belief that the ability of children to learn the social skills within the First Friends intervention will require EF skills. For example, children are required to practice and repeat poems and phrases, hold strategies or rules in mind while interacting with others in order to manoeuvre through challenging social situations that arise, problem solve in social situations, sit quietly and listen during circle time, take turns listening to other children, inhibit inappropriate behaviours, learn and utilize strategies to regulate their emotions, and flexibly shift between tasks and activities. All of these social behaviours rely on EF capacity to some degree. As a result, the First Friends intervention is hypothesized to not only improve social-emotional competencies, but also improve EF skills.

#### *The role of EF in social interventions*

Despite the extensive research indicating links between EF and social skills, very little research has actually examined the role of EF within an integrated framework of children's social-emotional development. A recent review (Riggs et al., 2006) addressed the lack of research to date that investigates the application of EF to models of social-emotional improvement and proposed testable models in which EF could be applied to intervention. Conceptualizing EF as a mediator is one such model (Riggs et al., 2006) that can be used to clarify the role of EF in social-emotional interventions.

Focusing on a mediation model can help researchers achieve a better understanding of the influence of EF on intervention outcomes (Riggs et al., 2006). For example, EF may influence intervention outcomes through mediating the relationship between the intervention and social-emotional enhancement. A mediator is a variable that accounts for or explains the relationship between the independent and dependent variable (Baron & Kenny, 1986). Despite their potentially central role, EF has received relatively little attention in the design and analysis of early childhood interventions (Bierman, Nix, Greenberg, Blair, & Domitrovich, 2008). There are some promising research avenues targeting EFs more specifically within school-based curriculum programs (e.g., Tools of the Mind; Bodrova & Leong, 2001; see Diamond, Barnett, Thomas, & Munro, 2007; and Second Step; Committee for Children, 1992 a, b, 1995; Frey, Hirschstein, & Guzzo, 2000). There are also some interventions (e.g., I Can Problem Solve; Sure, 2001; Shure & Spivack, 1982) that focus on enhancing skills within the domain of EF, thus potentially aiding in the development of EF (see Paschall & Fishbein, 2002 for a review of programs). Research on these interventions suggest that implementing lessons throughout the school year by teachers trained in these curricula may provide children with the ability to practice and develop EF skills and may also foster the strengthening of connections within the prefrontal lobes and between the prefrontal lobes and other areas of the brain (e.g., limbic system) linked to social and emotional proficiency (Riggs et al., 2006).

It is also possible that intervention programs that effectively promote social-emotional competencies can promote the development of EF, which in turn, then might facilitate the development of social and emotional outcomes. For example, research has

demonstrated that social-environmental stimulation can affect the development and maintenance of EF skills (see Riggs et al., 2006, for a review). This literature, along with the evidence linking EF to social competencies, and the knowledge that brain areas involved in both EF and social skills overlap, provide the basis for the hypothesis that a social-emotional preventive intervention program such as First Friends (Graham, 2000; 2006), can promote the development of EF skills. In addition, it is hypothesized in the current study that the promotion of EF skills will in turn mediate intervention effects on the social-emotional outcomes. Despite the potential of social skills interventions to affect related EF functions, very few prevention programs have integrated EF models into general theories of change. A more comprehensive mediational model is proposed here, which hypothesizes that the social skills intervention will promote EF development, which in turn will mediate the relationship between the intervention and social-emotional outcomes.

#### *Research on the role of EF in social interventions*

To the author's knowledge, only one study (Riggs, Greenberg, Kusché, & Pentz, 2006) to date has specifically assessed the mediational effect of EF on outcomes specific to a social-emotional intervention. This study analyzed the effects of the Promoting Alternative THinking Strategies (PATHS) Curriculum (Greenberg & Kusché, 1993; Kusché & Greenberg, 1994). The PATHS curriculum is a school-based, universal prevention program targeted at reducing aggression and behaviour problems through emphasizing the developmental integration of cognition, affect, and emotional language, and behaviour in the promotion of social-emotional competence in elementary school children. PATHS focuses on neurocognitive models of development (specifically frontal

lobes and limbic systems) by attempting to teach children skills that promote vertical control (higher-order cognitive processes originating in the prefrontal cortex and controlling lower-level limbic impulses) and horizontal communication (communication between the brains right and left hemispheres via the corpus callosum). In a study of 318 regular education second or third grade students, the PATHS curriculum was found to promote inhibitory control and verbal fluency. This finding supports the notion that a social skills intervention can promote EF skills. Furthermore, the effects of the PATHS curriculum on decreasing externalizing and internalizing behaviours was mediated by the improvements in EF, specifically inhibitory control (as measured with the Stroop Test; Golden, 1981) (Riggs et al., 2006). Verbal fluency was also hypothesized to be a mediator between program condition and externalizing and internalizing behaviours, but this was not supported.

Several weaknesses were identified in this study. First, inhibitory control and verbal fluency were operationalized with a single measure. As noted previously, task impurity is a problem common in EF tasks. Utilizing multiple measures to assess ability results in a more reliable and valid estimate of that ability (Anastasi & Urbina, 1997), as measurement error is more likely to affect interpretation at the level of individual tests (Macmann & Barnett, 1997), and the latent factors approach is becoming the mainstream analysis for EF research. Next, the study only assessed externalizing and internalizing problem behaviours, and neglected to assess the impact of the intervention and EF on specific social-emotional competencies. Lastly, problem behaviours were rated solely by teachers, who were the individuals responsible for administering the PATHS curriculum. As a result, there is the possibility that the positive findings are a halo or placebo effect.

A stronger method of analysis would be to use a blind study approach and measure outcomes from a variety of sources, including parents, outside observers, and the performance of children themselves on tasks assessing social-emotional competencies.

Another recent study (Bierman et al., 2008) utilized the Preschool PATHS curriculum (Domitrovich, Cortes, & Greenberg, 2007), which fosters social-emotional competencies implemented within a broader academic readiness intervention (Head Start REDI – REsearch-based, Developmentally Informed; see Bierman, Domitrovich, Nix, Gest, Welsh et al., 2008 for details) including components targeting language and emerging literacy skills. A total of 356 4-year-old children from socio-economically disadvantaged backgrounds were followed over the course of their pre-kindergarten year. This study used several EF measures. Cognitive EF tasks used included the backward word span task (Davis & Pratt, 1996), the peg tapping task (Diamond & Taylor, 1996), and the dimensional change card sort task (DCCS; Frye, Zelazo, & Palfai, 1995). Behavioural performance tasks were also used including a walk-a-line slowly task (Kochanska, Murray, Jaques, Koenig, & Vandegest, 1996) and a task orientation measure reflecting the participant's ability to sustain attention to the tasks and engage actively to achieve a goal (Smith-Donald, Raver, Hayes, & Richardson, 2007). All of these tasks were hypothesized to mediate the impact of the Head Start REDI program on school readiness. Results revealed that the REDI intervention promoted gains on two aspects of EF, the DCCS (marginally significant) and task orientation. These two EF measures were then tested as mediators of intervention effects, and task orientation was a significant mediator of the intervention effect on phonological sensitivity, observer-rated social competence, and observer-rated aggression. DCCS was not a significant mediator.

These results support the role of EF as a mediator of some of the outcomes of this particular academic readiness intervention, which included a social skills intervention component (Preschool PATHS).

In summary, two studies (i.e., Bierman et al., 2008; Riggs et al., 2006) have revealed that not only can a social skills intervention promote EF skills, but that the promotion of these EF skills may influence intervention outcomes through mediating the relationship between intervention and social-emotional outcomes. Use of this mediational model within a preventive intervention program can further enhance our knowledge of intervention outcomes. However, there is a paucity of literature in this area. To date, only one type of social skills intervention program (PATHS) has been utilized to investigate the mediational role of EF. It is important to expand upon this literature to assess if this mediation model still holds utilizing different social interventions. Furthermore, only one study has utilized this specific mediation model within an early childhood (i.e., preschool) at-risk population (Bierman et al., 2008), and it was assessed using a broader academic readiness intervention, as opposed to focusing on social-emotional competency. As mentioned previously, at-risk populations of children stand to benefit greatly from social-skills interventions, and thus research with these populations is especially important. Clearly more research is required in this area, using measures that assess social-emotional competencies, in order to clarify the impact that EF has on social-emotional intervention outcomes.

### *The importance of inhibition*

As noted in previous sections, EF is viewed as a unitary construct, which can be composed of partially separable components: working memory, inhibition, and mental

flexibility/set-shifting (Garon et al., 2008; Miyake et al., 2000). We can now look more clearly at the research summarized above to see which of these components (i.e., working memory, inhibition, or set-shifting) appear to play a major role in social-emotional intervention outcomes. A summary of the research showing the links between EF and social-emotional development clearly highlight the importance of the development of inhibitory control. Inhibitory control appears to be consistently related to different social competencies including delay of gratification, empathy, and TOM. Inhibitory control was also found to mediate the relationship between group assignment and teacher reported externalizing and internalizing behaviours in 2<sup>nd</sup> and 3<sup>rd</sup> grade children (Riggs et al., 2006). It can be argued that inhibitory control (an important component of self-regulation) is the most important component of the task orientation measure (Smith-Donald et al., 2007) that was found to mediate the relationship between group assignment and observer rated social competence and aggression. This research speaks to the importance of inhibitory control in social-emotional development and social-emotional intervention outcomes. Furthermore, early childhood, including the kindergarten year, is a period of particular importance for the development of inhibitory control. Significant gains in performance on inhibition tasks have been observed for children between the ages of 3 and 5 years (Carlson & Moses, 2001; Diamond & Taylor, 1996; Kochanska, et al., 2000).

Several of the social and emotional skills that develop and improve during the kindergarten year appear to require inhibitory control (see Kemp & Carter, 2005, for a review of essential skills for successful integration into kindergarten). For example, the ability to take turns and share requires inhibitory control, in order for a child to inhibit

inappropriate behaviours such as grabbing a toy without asking from another child or taking something out of turn. Self-control or self-regulation of emotions also improves during this age range, which requires the ability to inhibit inappropriate emotional and behavioural responses in social situations. Research has demonstrated that individual differences in inhibitory control are related to preschooler's ability to regulate their emotions (Carlson & Wang, 2007). An improvement in understanding the concepts of right and wrong and understanding and respecting rules also occurs during the kindergarten year, which requires inhibitory control in order to inhibit inappropriate response or behaviours which break rules or are "wrong" in a particular setting. Also, the ability to be assertive also develops over this year, allowing children to invite other children to play, or decline invitations from others, and to voice their opinions. Being assertive requires children to adopt a balance between getting what they want but doing it in a way that is not aggressive or overstepping boundaries, requiring inhibition to strike that balance. Children also learn during this time to find enjoyment in giving and sharing with others, which utilizes inhibitory control of their own desires and wants, in order to provide enjoyment for another (e.g., giving up a toy that they would really like to play with, sharing their possessions, etc.). In sum, it can be argued that several of the skills learned during the kindergarten year require inhibitory control. Therefore, it is reasonable to suggest that the inhibitory control component of EF will best explain changes in social emotional intervention outcomes in kindergarten-aged children.

### *Objectives of the Current Study*

Given the lack of literature examining the role of EF in social interventions, there is a clear need for further research in this area. First, research with at-risk early childhood

populations is essential, in order to address the developmental delays associated with socioeconomically disadvantaged children in this important aspect of development. Second, exploring the use of different social skill interventions is important in order to understand the essence of interventions and strategies that are beneficial in promoting social-emotional development in early childhood. Furthermore, addressing methodological issues within this area of research, specifically with regards to the task impurity problem inherent in EF tasks by utilizing a latent factors approach, is of value. Comprehensive assessment of EF is a necessity in order to properly clarify the role of specific EF components in any social intervention. In the current study, a rigorous research design was implemented to control for halo or placebo effects where parents, teachers, and observers rating child behaviours were 'blind' to group assignment. In addition, more comprehensive measures of social-emotional competency and problem behaviours from a variety of sources (parents, teachers, observers, and child performance) were utilized. Lastly, a comprehensive and developmentally appropriate set of tasks measuring the components of EF was utilized in order to identify if and what components of EF would be impacted by the First Friends intervention, and would mediate intervention outcomes.

The first objective of the current study was to assess the efficacy of the First Friends (Graham, 2000; 2006) social emotional preventive intervention program with kindergarten aged children from at-risk areas in promoting social-emotional and social cognitive skills and decreasing problem behaviours. The First Friends intervention (Graham, 2000, 2006) utilized in the current study is a time-limited, 8-week, intervention which targets similar social-emotional competencies to the PATHS curriculum, but is not

curriculum-based, nor implemented by educators. This intervention program uses didactic methods of training, and also experiential play groups to promote learning of skills within a motivational framework. Preliminary studies utilizing the First Friends intervention with at-risk preschool and kindergarten children demonstrated significant increases in positive social behaviour and decreases in negative social behaviour, according to observer report when compared to controls (Graham, 2000; 2006).

The second objective of the current study was to assess the role of EF in this novel First Friends social skills preventive intervention program. As noted above, the PATHS curriculum is the only intervention program that has examined the role of EF in social intervention research. Therefore, it is important to expand on this literature and see what role EF plays using different social interventions. The role of EF was examined in two ways.

First, EF was examined as an outcome measure, whereby the First Friends intervention was hypothesized to promote changes in the three EF components: working memory, inhibition, and set-shifting. The First Friends intervention was hypothesized to promote EF through two avenues. First, it is suggested that EF is required in learning and developing the social and emotional skills taught in the First Friends intervention. The First Friends intervention was designed to promote critical areas of social-emotional development including problem solving, conflict resolution, planning, identification of emotions, empathy, assertiveness, anger management, verbal communication, creativity and cooperation. The ability for children to learn and then practice these skills requires executive capacity. Working memory is required for children to hold the social strategies in mind while maneuvering through social situations. Inhibitory control is required to

listen and take turns during circle time, regulate emotions when using the anger management techniques, and inhibit inappropriate behaviors in favor of prosocial behaviors when interacting with peers. Set-shifting or mental flexibility is required for children to shift between tasks and activities and transition between the stages of the group. Second, brain pathways utilized in carrying out social-emotional skills overlap with those used in EF. Therefore, strengthening neural pathways targeting social and emotional skills should also impact EF given that these pathways overlap.

Second, the mediational role of these different EF components on social-emotional outcomes was examined. Some specific EF components (inhibition) have been shown to mediate outcomes, although the research is still young and it is unclear what specific EF components clearly mediate social intervention outcomes. As shown in the sections above, a significant amount of research has provided evidence for direct concurrent and longitudinal relationships between social and emotional skills and executive functions in early childhood. Therefore, it is hypothesized that improvements in EF will serve to mediate, or help explain the relationship between, the First Friends intervention and social-emotional and social-cognitive outcomes.

### *Hypotheses*

Given the literature reviewed above on EF and social skills, the following hypotheses were proposed:

- 1) The First Friends preventive intervention will significantly improve levels of social-emotional, social cognitive, and coping skills, and significantly decrease problem behaviours (according to parent, teacher, and observer

ratings and children's performance on a social-cognitive skills measure) compared to control group children.

- 2) The First Friends preventive intervention will promote gains in EF, as shown by significant intervention effects on latent EF constructs (i.e., inhibition, working memory, and set-shifting).
- 3) The promotion of latent EF construct values will mediate the relationship between group (intervention or control) and intervention outcomes (teacher, parent, and observer social skills and behavioural ratings, and children's social-cognitive task performance), with the latent inhibition construct being the strongest mediator of intervention outcomes.

## Method

### *Participants*

Participants were Kindergarten students from 4 schools in at-risk (socio-economically disadvantaged) areas of the Greater Victoria region (School District 62). Classrooms were randomly assigned to either the intervention group, or the control group. Classrooms instead of participants were randomly assigned in order to enhance the "blindness" of teachers to the study groups, and prevent cross-contamination of social skills learned in the group within the classroom.

Initially, 93 children assented and their parents consented to participate in this study. During the course of the study, six children moved away and were excluded from the final analyses. Therefore, a total of 87 children participated in this study. The control group consisted of 41 children (24 males, 17 females), with a mean age of 5.42 years (range 4.92 – 6.17 years). The intervention group consisted of 46 children (27 males, 19

females), with a mean age of 5.40 years (range 4.92-6.00 years). Mean age did not differ significantly between groups ( $p = .799$ ). See Table 1 for details on demographic variables separated by group.

Overall, approximately 13% of participant households made below \$20,000 per year, and 30% made below \$40,000. According to Statistics Canada (2009), as of 2008, low income measures for a household of four people was a gross annual income of \$42,378, which places the average participants' household income (for both groups, the average income was reported to be between \$40,000 and \$60,000 per year) within this range according to reported gross income and family size.

Table 1  
*Demographic Information*

<b>Demographic Variables</b>	<b>Control Group N = 41</b>	<b>Intervention Group N = 46</b>
<b>Ethnicity</b>	36 Caucasian 2 First Nations 2 Asian/Caucasian 1 Canadian African	29 Caucasian 4 First Nations 3 Asian/Caucasian 1 Canadian African 1 Canadian African/Caucasian 5 First Nations/Caucasian 1 Asian 2 Iranian
<b>Gender</b>	24 males 17 females	27 males 19 females
<b>Age</b>	$M = 5.42$	$M = 5.40$
<b>Handedness</b>	36 right handed 3 left handed 1 ambidextrous	39 right handed 2 left handed 5 ambidextrous
<b>Average number of siblings</b>	$M = 1.17$ $SD = .77$ Range = 0-4	$M = 1.33$ $SD = .97$ Range = 0-4
<b>Diagnoses</b>	ADHD = 1	ADHD = 2
<b>Income</b>	Below \$20,000 = 3 \$20,000-\$40,000 = 6 \$40,000-\$60,000 = 13 \$60,000-\$80,000 = 11 Over \$80,000 = 8 $M = 40-60$ thousand/year	Below \$20,000 = 9 \$20,000-\$40,000 = 8 \$40,000-\$60,000 = 11 \$60,000-\$80,000 = 10 Over \$80,000 = 8 $M = 40-60$ thousand/year
<b>Mother Education</b>	Some college/university	Some college/university
<b>Father Education</b>	Some college/university	High school equivalency

Note: ADHD = Attention Deficit Hyperactivity Disorder

#### *Assessment Tools and Procedures*

Pre- and post- intervention participant assessments were conducted within the schools by the principal investigator and a trained research assistant during individual pull-out sessions. Pre-intervention assessments began in late November 2009, after having time for children to acclimate to the classroom setting, and continued until February 2010. Pre-intervention assessments lasted 40 to 45 minutes. Post-intervention assessments began following completion of the intervention and control groups

(beginning at the end of April 2010) and continued into May 2010. The post-intervention assessments lasted approximately 35 to 40 minutes and were again conducted by the principal investigator and the same trained research assistant. Observers were two research assistants, one PhD level clinical psychology student, and one BSc level experimental psychology student. Observers were trained by the principal investigator by going through the observation checklist and describing specific behaviours to be aware of for each of the listed positive and negative behaviours. Observers were blind to group assignment. Each observer provided behaviour ratings for each participant over a 2-minute sampling period during class time on two separate occasions. Observers rated each participant at the same time: once during the pre-intervention assessment phase, and once again during the post-assessment phase.

Parents and teachers, also blind to group assignment, were asked to complete questionnaires both pre- and post-intervention. Teachers were compensated \$5 for each pre-intervention and post-intervention child assessment questionnaire completed. Parent incentive to complete forms was provided via a raffle, in which parents who completed both pre- and post-intervention forms were entered into a raffle to win a \$200 gift certificate. Funding for this research was obtained from the Human Early Learning Partnership at the University of Victoria – Research in Early Education and Child Health (HELP UVic: REACH), and the Sara Spencer Foundation. For the 87 participants in this study, the questionnaires were typically completed by biological parents (n=85), though one respondent was a legal guardian/grandmother, and one an adoptive parent.

### *Cognitive/IQ Measure*

The nonverbal subtest, Matrices, of the Kaufman Brief Intelligence Test, Second Edition (KBIT-2; Kaufman & Kaufman, 2004) was used as a brief measure of nonverbal intelligence. This subtest consists of 46 various items involving visual stimuli (i.e., people, objects, designs, and symbols). All items are multiple-choice and required either a pointing response, or a corresponding letter response. Each item included at least five response options. The participant was required to select one of the five pictures that corresponded to a target/stimulus picture (e.g., a car goes with a truck, a pillow goes with a bed). The items at the start were easier (e.g., car goes with a truck), and then became harder and more abstract (e.g., selecting a specific picture to match a pattern). This task was brief, and took approximately 10 minutes to administer. Normative data were available on individuals aged 4 through 90. Reliability and validity of this measure are high. For the Nonverbal score, internal consistency reliability ranges from .78 to .93, test-retest reliability ranges from .76 to .83. Concurrent validity of the composite measure is substantial, ranging from .80 to .86.

### *Executive Function Measures*

#### Inhibition Tasks

***NEPSY-II Inhibition:*** This task was adapted from the NEPSY-II (Korkman, Kirk, & Kemp, 2005) Inhibition task. The adaptation was that instead of alternating black or white shapes or arrows, all stimuli were white. This adaptation did not affect the validity of the measure, as the alternating black and white forms are unnecessary for the inhibition portion of the task. The NEPSY-II Inhibition task contained two subtests, Shapes and Arrows. Each subtest had two parts, and each part began with a teaching

example. In the first subtest, Shapes, participants were shown a row of circles and squares, and asked to name the shapes as quickly as possible. The examiner demonstrated how to complete the task, and then the participants practiced, with the examiner correcting any errors. Once the participants understood the task, they were shown another sheet with 5 rows of 8 circles and squares (randomly alternating for a total of 40 stimuli), and were asked to say the names of the shapes as quickly as possible without making mistakes. In the next part, the inhibition trial, participants were again shown the practice row, and were told they would do something different. They were told that when they saw a square they had to say “circle”, and when they saw a circle they had to say “square”. The examiner demonstrated how to complete the task, and then the participants practiced and the examiner corrected any errors. Once participants understood the task, they were again shown the sheet with 5 rows of 8 randomly alternating shapes and asked to do the same thing they had just done as quickly as they could without making mistakes. Time to completion was recorded, along with all errors (i.e., self-corrected and uncorrected). Error data was used in the analyses.

The second section followed the same two trials, but this time the participant was shown upward and downward pointing arrows. In the baseline trial participants were asked to state the direction the arrows were pointing in (i.e., up or down). In the inhibition section, participants were asked to state the opposite direction (i.e., down for an arrow pointing up, and up for an arrow pointing down). Time to completion and all errors were recorded. Error data were used in the final analyses.

***Dog Koala Go/No-Go:*** In the Dog Koala Go/No-Go (Hrabok, Kerns & Mueller, 2007) computerized task participants were asked to touch the screen when they saw either dogs,

or koala bears. For each block the rule changed for a total of 4 blocks. In the first baseline block, only dogs appeared on the screen and participants were asked to touch the dogs as quickly as possible every time they appeared. In the second block both koala bears and dogs appeared on the screen, and participants had to inhibit touching the dogs (“no-go” for the prepotent response), and only touch koala bears (“go” response). In the following block, koalas and dogs appeared again, and participants were told to touch only the dogs and not the koalas. In the last 2 blocks participants continued to alternate between touching koalas and dogs. Each block lasted approximately 30-45 seconds and the stimuli appeared randomly on the screen at varying intervals. Total commission errors from blocks 2, 3, and 4 were used in the analysis. See Appendix A for detailed task instructions.

***Boy/Girl Stroop:*** This was a computerized task where participants were shown a picture of a boy and a girl on the computer screen and were told they would be playing a “silly game” where they were going to say “boy” when they saw a girl and “girl” when they saw a boy. Participants first practiced the task, and then proceeded to the test portion once they understood the task instructions. The test consisted of 20 randomly ordered boy/girl stimuli. See Appendix A for detailed task instructions. Errors were used in the analysis.

#### Working Memory Tasks

***Backward Digit Span*** (Davis & Pratt, 1996): Participants were told they were going to play a “silly game”, where they needed to say whatever the examiner said backwards, or in the opposite direction. Two practice trials of 2 digits were then presented. Each number block contained two trials and went to a total of 4 numbers. Participants received

one point for each trial correct (for up to a total of 2 points per number block). The task was discontinued when the participant got both trials of a block incorrect. Number of correct trials was recorded and used in the analyses. See Appendix A for instructions and stimuli.

***Backward Word Span*** (Davis & Pratt, 1996): Participants were told they were going to play a “silly game”, where they needed to say whatever the examiner said backwards, or in the opposite direction. Two practice trials of 2 words each were then presented. Each word block contained two trials and went up to a total of 4 words. Participants received one point for each trial correct (for up to a total of 2 points per word block). The task was discontinued when the participants got both trials of a block incorrect. Number of correct trials was recorded and used in the analyses. See Appendix A for instructions and stimuli.

***Jack in the Box Working Memory Game***: The Jack-in-the Box Working Memory game (Hrabok, Kerns & Mueller, 2007) was a computerized task where participants see several boxes randomly placed on the computer screen. Participants were told that ‘Jack’ was hiding in one of the boxes, and it was their job to find him. Once found, Jack would hide again, however, he would never hide in the same box twice. The game started with a practice trial with two boxes on the screen. After participants understood the task instructions, they moved on to the first trial. Each participant was given two trials per block (separated according to the number of boxes – beginning at 2 boxes, and moving up to 5 boxes). There was no discontinue rule. Within and between errors were recorded, summed, and used in the analyses. See Appendix A for detailed task instructions.

### Set-Shifting Tasks

***Color/Shape Task.*** This task was modified from the Shape School set-shifting subtask designed by Espy (1997). Instead of hats on the cartoon people, glasses were used. The participant was first shown a practice page consisting of coloured circles and squares with cartoon faces and told that the names of the characters were their colors. The participant first practiced on 6 stimuli, and then viewed a 3 row by 5 stimuli configuration of the cartoon shape people. For this baseline test, the participant was asked to say the colors as fast as they could without making mistakes. In the set-shifting condition, the participant was shown a practice page of 6 different cartoon shapes, and told that for most of the people, they would still name their colors, but, if the people were wearing glasses, they would name their shape. The participant practiced and was then shown the test page (3 row by 5 stimulus configuration, 8 without glasses and 7 with glasses). The participant was asked to state the colors of people without glasses, and state the shapes of people with glasses as quickly as they could without making mistakes. Completion time and errors were recorded and completion time was used in the analyses. See Appendix G for task stimuli.

***Animal-Color task:*** This task was designed as a variant of the Shape School task (Espy, 1997). Participants were shown a row consisting of animals inside of boxes, some that were coloured. The examiner told the participants that they were going to play a naming game. Participants were asked to name the animal or color inside of each box. If the box was coloured, they were required to name the color, but if the box was not coloured, they were required to name the animal. The examiner demonstrated how to complete the practice trial and then the participant practiced to ensure understanding before completing

the test page. Completion time and errors were recorded. Completion time was used in the analyses. See Appendix A for instructions and Appendix H for task stimuli.

***Progressive Figures Test*** (Reitan & Wolfson, 1990): This task was designed to assess flexibility in thinking. This test was presented on a single sheet of paper, with a practice trial on the front and the test itself on the reverse side. The pages contained figures of different shapes. Each large figure contained a smaller figure. The participants were shown where to start the task and were instructed to draw a line from one shape to the next until the sequence was completed, using a smaller figure (e.g., circle) included within a larger figure (e.g., square) as a cue for selecting the next larger figure (e.g., a larger circle). The larger circle also contained a smaller figure that served as the cue for moving to the next larger figure and so on until being led to the beginning point. Participants first practiced and the examiner corrected errors. After the practice, the examiner turned the page over, pointed to where the participant was required to start, reminded the participant of the instructions, and began timing. Errors were pointed out to the participant. Completion time was recorded and used in the analysis.

### *Social Skills Measures*

#### Social-cognitive skills

A variation of the Challenging Situations task (Denham, Bouril, & Belouad, 1994) was used. This measure assessed participant's behavioural responses to hypothetical challenging peer situations. A challenging situation is one in which affect is elicited from a child and his/her abilities are challenged within the critical peer relationship (Denham et al., 1994). Participants were first presented with four pictures of same gender children (e.g., pictures of faces of females for female participants) depicting sad, happy,

angry/mad, or neutral facial expressions. Each picture was presented individually, in randomized order, and the examiner asked the participant “How do you think this boy/girl feels?” Participants received one point for each correct answer, up to a total of 4 points. Participants were then presented with four peer scenarios (i.e., a peer knocking down the blocks of another child, a child entering a group, a child being hit, a peer taking a ball from another child). Each scenario was offered individually and included presenting the participant with a picture of the challenging situation, along with a verbal description of the scenario. The participant was then instructed to pretend that he/she was in the situation and to respond to questions as if it was a real situation for him/her. The participant was first asked how he/she would feel in the situation. If unable to respond, the participant was presented with the four feeling cards with children depicting happy, sad, angry, or neutral facial expressions and asked to point to the picture that best described the answer to “how would you feel if [this situation] happened to you?” After the participant verbally described a feeling or selected a picture, he/she was asked “What would you do [in this situation]?” The participant was given an opportunity to provide a spontaneous response. If unable to provide a spontaneous response, the participant was provided with four categories of possible behavioural responses (i.e., prosocial, aggressive, manipulative, and avoidant) presented in a random order and asked to choose what he/she would do. Prosocial responses involved engaging the other person in constructive play, problem-solving within the situation, not becoming upset, and/or discussing the problem. Aggressive responses included yelling, hitting the other person, or destroying the peers’ game. Manipulative responses included crying or pouting. Avoidant responses included ignoring the other person, withdrawing from the interaction,

waiting on the sidelines, or having another person deal with the situation for them (i.e., telling a parent or teacher instead of attempting to solve the problem themselves). See Appendix B for details of task scenarios and behavioural responses. For each scenario, the responses were coded based on the social skill and appropriateness of the response (i.e., the more prosocial a response, the higher the coding). Therefore, a prosocial response was given the highest value, a 2, an avoidant response a 1, and aggressive or manipulative responses a 0. Values for the Challenging Situations Task were raw scores based on performance with a possible range of 0 to 12; a maximum of 4 points for correctly identifying feeling faces, and up to 8 points for scenario responses. Higher scores represented better social cognitive and emotion recognition abilities.

#### Parent and Teacher ratings

The Preschool and Kindergarten Behavior Scales – 2<sup>nd</sup> edition (PKBS-2, Merrell, 2002) questionnaire was used with parents and teachers to assess pre- and post- social skills and externalizing and internalizing behaviours. The PKBS-2 is a behaviour rating scale designed for use with children ages three through six and takes approximately 8 to 12 minutes to complete. The PKBS-2 includes 76 items separated into two scales (Social Skills and Problem Behaviours). The PKBS-2 has good internal consistency reliability ranging from .96 to .97 for the two scales. Test-retest reliability is moderate to high with Pearson product-moment correlations ranging from .58 to .86. Research has revealed this instrument to be psychometrically sound (Allin, 2004). Parent and Teacher reported Social Skills as measured by the PKBS-2 ranged in value from 0 to 102, with higher values indicating better social skills. Parent and Teacher reported problem behaviours as

measured by the PKBS-2 ranged in value from 0 to 126, with higher scores indicating more problem behaviours.

Parents were also given a questionnaire developed by Eisenberg, Fabes, Nyman, Bernzweig, and Pinuelas (1994) that measured child coping in three emotionally relevant situations, and overall child coping in problem situations. Parents first read three short vignettes about a child being excluded from a peer group, being made fun of, or having a block tower destroyed by another child. Using a 7-point Likert-type scale (i.e., 1 = not at all likely, 7 = extremely likely), parents rated the extent to which their child was likely to use each of the 9 different coping strategies: (a) instrumental coping (takes some constructive action to improve a problem situation), (b) emotional intervention (cries to elicit assistance from others to help solve the problem), (c) instrumental aggression (resolves problems through physical or verbal aggression), (d) avoidance (leaves or avoids a problem situation), (e) distraction (keeps him- or herself busy so as not to think about the problem), (f) venting (cries to release pent-up feelings or elicit comfort from others), (g) emotional aggression (uses physical or verbal aggression to release pent-up feelings), (h) cognitive restructuring (tries to think about the situation in a positive way), and (i) emotional support (talks about his or her problems with friends or a teacher in hope of getting support). The authors report high internal consistency for each of the nine coping strategies across the three vignettes ( $\alpha$ s = .88 to .98). The final section of the questionnaire contains 13 general items that describe the various coping strategies above and required the parents to read each item and then indicate on the same 7-point Likert scale how their child deals with problems. Scores for each of the coping strategies on all items were aggregated and averaged across the three vignettes and an overall score was

obtained from the final general items. Positive coping strategies (i.e., instrumental coping, avoidance, distraction, cognitive restructuring, and emotional support) were reverse-coded. Thus higher scores on the averaged vignettes or total general coping items reflected poorer coping strategies. See Appendix C for the questionnaire items which include examples of each of the coping strategies. Child coping skills as rated by parents on the Parent's Children's Coping Scales questionnaire were split into two scores. The first score was an average of children's rated coping abilities over three different specific vignettes or possible situations. The second score was an overall rating score indicating how parents felt their child generally dealt with problems. For both measures, higher scores indicate poorer coping strategies, or less adaptive coping responses.

#### Observer ratings

Participants were observed by trained research assistants blind to group assignment for two 2-minute sessions (one pre-intervention and one post-intervention) within their classroom and during social interactions with their peers. Observers tallied each child's negative/anti-social and positive/prosocial behaviours during the same 2 minute time-frame according to the observation checklist (see Appendix D; Graham, 2000, 2006). An inter-rater reliability analysis using Kappa statistic was performed to determine consistency among raters. Inter-rater reliability for pre-intervention measures of positive social behaviours (Kappa = .630,  $p < .001$ ) and negative social behaviours (Kappa = .848,  $p < .001$ ) and for post-intervention measures of positive social behaviours (Kappa = .860,  $p < .001$ ) and negative social behaviours (Kappa = 1.000,  $p < .001$ ) ranged from substantial to almost perfect agreement. Therefore, observer scores were averaged both pre-and post-intervention and used in the analyses. Values presented

represent the average number of positive or negative behaviours observed over the two minute observation period.

### *Demographic Questionnaire*

Parents were asked to complete a brief demographic questionnaire during the pre-intervention assessment phase. This questionnaire allowed for the collection of important demographic information. See Appendix E for the questionnaire.

### ***Preventive Intervention: First Friends***

The social skills preventive intervention (First Friends) used in this study was designed by a clinical psychologist, Dr. Shirley Graham (Graham, 2000, 2006). The school environment is an optimal place in which to implement any preventive intervention program given that children spend a significant portion of their day in school. The school environment also represents an ideal location to identify children in need of services. The First Friends program was designed to offer a time-limited, supervised group play experience to children in preschool or kindergarten with the goal of promoting the following social skills: problem solving, conflict resolution, planning, identification of emotions, empathy, assertiveness, anger management, verbal communication, creativity, and cooperation. The program was created as both a universal prevention and a specific intervention. There is a wide range of social skill ability and temperament in any group of school children and this program was designed to meet these varying needs (Graham, 2000, 2006). Each session included the teaching of a specific social skill or concept to the group, a play session in which children were encouraged and motivated to utilize and practice the skills learned and individual interventions during a play session, where group facilitators chose specific interventions

based on the individual child's needs and abilities. The First Friends program thus has the ability to be a "manualized" replicable program and a therapeutic individual intervention, informed by evidence based understanding (Graham, 2000, 2006). The program was also designed with the potential benefit of simultaneously improving individual and group skill dynamics. With every individual intervention, skills are also being modeled for the entire group. In other words, children can learn their own skills, and can reinforce skill learning in their peers. They can benefit from greater personal ability and a greater level of personal awareness and sensitivity among their class of playmates (Graham, 2000, 2006). It is rare within a large classroom setting that each child receives the individual attention they need. Thus, the First Friends intervention was designed to be implemented with small groups of 6 to 8 children, with the goal of providing individual attention to all children during the course of the play group. Learning was facilitated through didactic teaching, experiential play, individual intervention, and modeling from children in the group. In this way, the groups had the potential for children to learn skills in a variety of formats and improve and practice these skills with their classroom peers (Graham, 2000, 2006). Furthermore, these groups were designed with motivation seen as a key learning tool. In theory, it is believed that children will learn best when motivated to do so, such as when confronted with a conflict or learning opportunity during peer group play. For example, when children want something to occur during play (e.g., using a certain toy, playing with a particular child or group, etc.), they are likely more motivated to learn skills within this environment, than when passively or ambiguously learning skills through strictly didactic or vicarious means. These activities were designed so that children would have the opportunity to interact with their peers. Activities were chosen

where conflicts arise, allowing group facilitators to intervene at opportune, motivationally laden times to teach and emphasize particular skills that would help children problem solve in social situations. Children also learned how to more effectively manoeuvre through social exchanges and arrive at solutions (Graham, 2000, 2006). Furthermore, the opportunity for children to practice emerging social skills was a key component of these groups. Learning was facilitated by these opportunities to practically apply emerging skills.

For the current study, groups of 6 to 8 children were formed from each kindergarten class. Eight weekly 30 minute sessions were led by two facilitators (the primary investigator and Dr. Shirley Graham). The groups were held in back-to-back sessions and run during normal kindergarten hours, taking place at the school in a separate room provided by the school.

The eight social skills targeted by the weekly groups covered the following areas:

1. Identifying Feelings – children were taught to identify, verbally label and express different feelings.
2. Empathy – children were taught to identify and label the feelings of others.
3. Assertiveness – children were taught the value of assertive communication, and how to effectively communicate their ideas and opinions to their peers.
4. Anger Management – children were taught strategies to control or regulate strong emotions, such as anger.
5. Conflict Resolution – children were taught the steps involved in resolving conflict with peers.
6. Caring/Nurturing – children were taught the value of caring for others.

7. Planning/Decision Making – children were taught the steps to decision making.
8. Self-Esteem – the value of each child was emphasized in the final week.

The sessions began by having all children sit in a circle. Groups began with a brief "hello" ritual, followed by a didactic portion, which included an age-appropriate teaching element, covering such issues as identification of feelings and conflict resolution. The children then engaged in supervised free play (orchestrated to elicit behaviour concerning the social skills theme for each day) for approximately 20 minutes, while the facilitators observed and intervened as needed for problem solving (e.g., asking the children come up with possible solutions to the presenting problem, having them select a solution and try it, and if it did not work then trying another possible solution), conflict resolution (identifying who was involved in conflict, having all parties take turns describing the situation and what their intentions were and how they felt, then having children come up with a solution, or providing a solution for the children to practice and model for the group [e.g., apologizing, taking turns and sharing, deciding where they should color on the paper, etc.], modeling (having children involved in conflicts or problem solving or other social interactions attempt solutions or problem solving in front of other children where these attempts were modeled for the group and all children could learn from them whether or not the attempts worked), or individual support (e.g., providing children with possible solutions to problems or conflicts, skills or methods for group entry or peer play opportunities, providing praise or encouragement for prosocial skills demonstrated, etc.). Play themes were chosen to progressively increase the need for cooperative interaction among the children and to offer them a chance to express needs, fears, or fantasies through their play (see Appendix F for a detailed description of

Weekly Activities). The groups concluded by having children revisit the circle, review the social skills learned that week, and engaging in a chosen goodbye ritual (typically joining hands and cheering). Children were given a sticker to remind them of the activity for the day, and then brought back into their classroom (i.e., children formed a line and walked back to the classroom with the facilitators).

### ***Control Groups***

As with the intervention classroom, children in control classrooms were divided into groups of 6 to 8 children each. Each 30 minute control group session followed the same general format as the intervention groups: a didactic portion followed by an independent activity, then children received stickers and were brought back to their classroom. The didactic portion included reading a book/several books on a specific topic, followed by an independent activity related to the book(s). An independent activity was selected instead of free play as it was believed that the free play portion of the social skills intervention was an essential element in promoting social-emotional development in children, allowing them to interact with their peers in a safe environment and practice the learned social and emotional skills taught within the didactic portion. Activities that did not allow for interactive play helped control the environmental conditions of this group and did not promote social-emotional skills. All activities chosen for the control group were similar to activities the children would perform within a regular classroom, allowing for a similar learning experience, without any specific promotion of social or emotional competencies beyond what would be experienced within their regular Kindergarten classroom (see Appendix F for a detailed description of Control Group Weekly Activities).

## Procedure

### *Analytical Approach*

The independent variable was intervention status (either in First Friends preventive intervention or control group). The dependent variables were the outcome ratings (post-intervention) that were based on parent and teacher ratings on the PKBS-2, parent ratings on the child coping measure, observational ratings, and children's performance on a social-cognitive skills task. Specifically, dependent variables included the scales of the PKBS-2: Social Skills and Problem Behaviours, parent ratings on the children's coping measure, mean observer ratings of positive and negative social behaviours, and child performance on the Challenging Situations Task. This totalled 9 dependent variables: 5 outcome ratings (4 from teachers and parents on the PKBS-2, 2 from parents on the Child Coping Measure), 2 observer ratings (positive and negative social behaviours), and 1 child measure of social-emotional and social-cognitive competence. Covariates included preliminary or baseline parent, teacher, and observer ratings, child pre-intervention performance on the emotional awareness and social cognitive task, and child pre-intervention performance on EF tasks. The mediator variables were post-intervention EF latent constructs of inhibition, working memory, and set-shifting.

### *Path Analyses*

Using the SPSS 15.0 software package (2006), hierarchical linear regression analyses were performed to determine the effect of the First Friends intervention on each of the 9 outcome measures. Covariates for these models included pre-intervention or baseline scores of the outcome measures. The group variable (control or intervention)

was entered last in the model as the independent variable of primary interest. This procedure was employed to increase power and evaluate which outcome measures would then be assessed in the mediation analyses using a SEM framework.

### *Structural Equation Modeling (SEM)*

SEM is a statistical approach combining confirmatory factor analysis and path analysis to test the fit of *a priori* derived measurement models. SEM procedures highlight construct variance and can reduce measurement error or error variance in specific stimuli or task materials. SEM was employed in the present study in order to examine the fit of each mediation model and corresponding latent factor scores for the 10 EF measures on 3 latent EF factors. Combining the various EF measures into 3 latent factors has advantages including increasing convergent validity through combining common variance across the different EF index measures for each latent EF factor and improving reliability of the individual EF measures by reducing measurement error. In addition, the use of SEM to test several pathways simultaneously as in the mediation analyses can help to yield more stable parameter estimates. The AMOS 7 software package (Arbuckle, 1995) was used to derive latent constructs (inhibition, working memory, set-shifting) from the various EF tasks and then to examine the mediation effect of each latent EF factor on the social outcome measures. Each model was scaled by fixing one indicator measure to 1.0 for each factor. Model fit was evaluated using several fit criteria. The chi-square goodness-of-fit test (Loehlin, 1998) was used, with values that exceed .90 indicating a reasonable model, and values over .95 indicating a remarkable model. The comparative fit index (CFI; Bentler, 1990) was also used as it is a robust index even with small samples. The CFI ranges from 0 to 1, with values equalling .95 or higher indicating good fit. The root

mean square error of approximation (RMSEA; Steiger, 1990) is a well respected fit criterion that takes into account model complexity. An RMSEA of .05 or less indicates good fit, .05 to .08 indicates adequate fit, and .08 to .10 represents mediocre/borderline fit, with .10 and higher reflecting poor model fit. The ratio of chi-square to degrees of freedom (Bollen, 1989) was the final fit criterion used, with values no greater than 3 indicating acceptable models. The maximum likelihood estimation procedure was used to estimate the parameters of all SEM models in the current study. This procedure was utilized with SEM with the goal of more closely approximating population estimates.

### *Mediation Analyses*

A variable is regarded as a mediator if there is a significant indirect relationship between the independent and dependent variable (Baron & Kenny, 1986; Judd & Kenny, 1981). In testing mediation effects, first the indirect relationship is determined to exist, and then the reliability and significance of the indirect or mediation effect is analyzed. The first step run in the analyses assessed if a significant effect between group membership and social-emotional outcome measures existed (controlling for pre-intervention social-emotional skills measures). This step was a test of hypothesis 1, and was carried out using hierarchical linear regression analyses in SPSS. Regression analyses was employed in the current study to reduce the chance of making a Type I error through decreasing the number of analyses, and evaluating which outcome measures would be used in the mediation analyses. Those outcome variables that resulted in significant intervention effects were then assessed as part of larger mediation models using the mediational analyses procedures outlined by Hayes (2009). The SEM analyses were examined for evidence that the independent variable (group membership) affected

the latent EF mediator variable, while controlling for the pre-intervention latent EF factor values (a test of hypothesis 2). In randomized experimental designs with experimental manipulation, an indirect (mediated) effect suggests that the independent variable will impact the mediator, which, in turn, affects the dependent variable (Holland, 1988). The SEM analyses were then examined to determine if the EF latent mediator variables affected the dependent variables. This examined whether a direct effect existed between the EF factor values at post-intervention and the social-emotional outcome measures. An estimate of the indirect effect (mediation effect) was then determined using bootstrapping (tests hypotheses 3). Bootstrapping is one of the more powerful and valid methods for examining intervening variable effects (Hayes, 2009; Williams & MacKinnon, 2008).

In the current study, SEM was used to assess the fit of the EF meditational models using the same fit criterion described above. Mediation models were run for those dependent variables shown to have a significant intervention effect according to preliminary path analyses. Each mediation model included the independent variable group membership (either control or intervention group), the mediator variable (one of the latent post-intervention EF components), an outcome measure, and two covariates controlling for baseline performance (the latent baseline EF component, and baseline performance on the outcome measure).

## Results

### *Preliminary Analyses*

The nonverbal subtest, Matrices, of the Kaufman Brief Intelligence Test, Second Edition (KBIT-2; Kaufman & Kaufman, 2004) was used as a measure of nonverbal intelligence and assessed during the baseline/pre-intervention phase. Mean IQ for

children in the control group was 101 ( $SD = 10.04$ ), and for children in the intervention group was 98 ( $SD = 9.94$ ). IQ did not differ significantly between groups,  $t(85) = 1.446$ ,  $p > .10$ . Given that both age and IQ did not differ significantly between groups, they were excluded from any future analyses.

### *Path Analyses*

Distribution of social and behavioural outcome data (dependent variables) were first examined for aspects of normality. Data were examined for outliers and values greater than 2.5 SD above the mean were trimmed. Trimmed outliers composed 1.4 percent of the data, and to compensate for these trimmed values, means and intercepts were estimated in subsequent analyses. For the trimmed data, estimates of skewness ranged from  $-.71$  to  $2.23$ , with only one indicator (post-intervention observed negative social behaviours) slightly reaching beyond the critical value of 2 (see Crocker & Algina, 1986). Furthermore, kurtosis estimates ranged from  $-1.15$  to  $3.98$ , with no variables extending beyond the critical value of 7 (see Finney & DiStefano, 2006). These estimates of skewness and kurtosis indicate that no variables significantly violate assumptions of univariate normality, and only one variable only slightly departs from normality, which can easily be handled by the maximum likelihood estimation procedure employed in SEM.

Hierarchical linear regression models were used to determine the effect of the First Friends intervention on each of the nine outcome measures. For each model, the pre-intervention or baseline scores for the outcome measures were entered first as covariates, followed by the group variable (control or intervention) as the independent variable of primary interest. Table 2 shows means and standard deviations for pre- and post-

intervention values of outcome measures by group. All values in Table 2 represent raw or mean scores.

Table 3 shows unstandardized betas, standardized errors, standardized betas, and  $R^2$  and  $R^2$  change statistics for the regression analyses. Regression analyses revealed significant intervention effects on observed positive social behaviours ( $t = 3.19, p < .01, R^2$  change = .107) indicating that 10.7% of the variance in positive social behaviours were accounted for by the intervention. A significant intervention effect was also revealed for observed negative social behaviours ( $t = -2.16, p < .05, R^2$  change = .053) indicating that 5.3% of the variance in negative social behaviours were accounted for by the intervention. Ratings revealed that on average, children who participated in the intervention demonstrated approximately one less negative behaviour, and one more positive behaviour during this two minute observation period, compared to children in the control group, whose behaviours did not change significantly over time. The range of negative behaviours observed at baseline for children in the intervention was 0 to 4, while at post-intervention the range was 0 to 1. For children in the control group, the range of negative behaviours observed at baseline was 0 to 4, and at post-intervention the range was 0 to 2. For positive behaviours observed, the range for children in the intervention at baseline was 0 to 4.5, and post-intervention the range was 1 to 6. The range of positive behaviours observed in children in the control group at baseline was 0 to 4, and post-intervention the range was 0 to 4.5.

Finally, children's scores on the social cognitive task also resulted in a significant intervention effect ( $t = 9.42, p < .001, R^2$  change = .514) indicating that 51.4% of the variance on the Challenging Situations Task was accounted for by the intervention. These

results revealed that children who were involved in the First Friends Preventive Intervention demonstrated more positive social behaviours, less negative social behaviours (or problem behaviours), and greater social-emotional cognitive skills than children in the control group. No significant intervention effects were revealed for parent or teacher measures. For these three outcome variables, baseline or pre-intervention scores did not account for any significant variance in post-intervention measures. For this reason, pre-intervention scores for these outcome variables (post-intervention positive social behaviours, negative social behaviours, and Challenging Situations Task) were excluded as covariates from future SEM analyses.

Table 2  
*Descriptive Statistics of Social and Behavioural Measures by Group*

Measure		Controls			Intervention		
		N	<i>M</i>	<i>SD</i>	N	<i>M</i>	<i>SD</i>
Parent Report: Social Skills	PRE	41	88.00	8.91	46	89.93	8.76
	POST	41	88.46	7.89	44	88.93	8.88
Parent Report: Problem Behaviours	PRE	41	34.93	15.33	44	36.95	18.31
	POST	40	34.90	17.38	45	38.53	21.66
Teacher Report: Social Skills	PRE	40	91.80	11.13	45	83.56	13.73
	POST	41	95.39	9.22	45	89.49	12.99
Teacher Report: Problem Behaviours	PRE	40	13.80	18.31	45	25.80	26.18
	POST	41	8.63	14.23	43	17.58	22.15
Parent Report: M Coping Skills	PRE	41	38.26	6.31	44	38.28	6.46
	POST	41	36.21	7.04	44	36.87	7.79
Parent Report: O Coping Skills	PRE	41	48.93	7.46	44	49.30	7.18
	POST	41	46.88	8.46	45	47.11	9.04
Observed Positive Social Behaviours	PRE	41	2.27	.96	46	2.39	1.11
	POST	41	2.13	1.01	46	2.86	1.13
Observed Negative Social Behaviours	PRE	41	.44	.77	46	1.01	1.17
	POST	41	.37	.70	46	.13	.34
Social Cognitive Skills	PRE	41	7.76	1.66	45	7.51	1.74
	POST	41	7.76	1.37	46	10.54	1.38

*Note.* PRE represent data collected at baseline, POST indicates data collected after the intervention. M Coping Skills = averaged coping skills over the vignettes. O Coping Skills = overall coping skills. Higher coping scores equal poorer coping strategies.

Table 3  
*Intervention Effects on Outcome Measures*

		<i>b</i>	<i>SE b</i>	$\beta$	$R^2$
Parent Report: Social Skills	Pre-Intervention	.58	.09	.60***	.349
	Group	-.66	1.46	-.04	$\Delta$ .002
Parent Report: Problem Behaviours	Pre-Intervention	.70	.10	.60***	.360
	Group	2.26	3.39	.06	$\Delta$ .003
Teacher Report: Social Skills	Pre-Intervention	.63	.07	.71***	.518
	Group	-.75	1.84	-.03	$\Delta$ .001
Teacher Report: Problem Behaviours	Pre-Intervention	.57	.06	.70***	.512
	Group	2.00	2.94	.05	$\Delta$ .003
Parent Report: Averaged Coping Skills (Vignettes)	Pre-Intervention	.82	.09	.70***	.489
	Group	.63	1.13	.04	$\Delta$ .002
Parent Report: Overall Coping Skills	Pre-Intervention	.78	.10	.65***	.419
	Group	-.05	1.44	-.00	$\Delta$ .000
Observed Positive Social Behaviours	Pre-Intervention	-.12	.11	-.11	.008
	Group	.74	.23	.33**	$\Delta$ .107
Observed Negative Social Behaviours	Pre-Intervention	.05	.06	.09	.000
	Group	-.26	.12	-.24*	$\Delta$ .053
Social Cognitive Skills: Challenging Situations Task	Pre-Intervention	.06	.09	.05	.000
	Group	2.80	.30	.72***	$\Delta$ .514

*Note.* Group was coded as 1 = control, 2 = intervention, *b* = Unstandardized beta coefficient, *SE* = standard error,  $\beta$  = standardized beta coefficient. \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .0001$ .  $\Delta$  =  $R^2$  change.

### *SEM*

Prior to running confirmatory factor analyses in SEM, the EF data was examined for aspects of univariate and multivariate normality. SEM analyses are susceptible to outliers, and therefore those values greater than 2.5 SD above the mean were trimmed. Trimmed outliers composed 1.5 percent of the data, and to compensate for these trimmed values, means and intercepts were estimated in the SEM analyses. Estimates of skewness ranged from -.42 to 1.23, with no indicators exceeding the critical value of 2 (see Crocker & Algina, 1986). Furthermore, kurtosis estimates ranged from -.95 to 1.13 with no

variables exceeding the critical value of 7 (see Finney & DiStefano, 2006). These estimates of skewness and kurtosis indicate that no variables violate assumptions of univariate normality.

The EF data were also assessed for multivariate normality prior to trimming the data using Mahalanobi's Distance Statistics. According to the criteria of the Mahalanobis  $< .001$  as indicator of outliers, the inhibition data contained 3 outliers, the working memory data contained 1 outlier, and the set-shifting data contained 4 outliers, which were trimmed, and subsequent analyses revealed that assumptions of multivariate normality were met. See Table 4 below for descriptive statistics for the trimmed EF indicator variables separated by group.

Table 4  
*Descriptive Statistics for the trimmed EF Indicator Variables*

Measures		Controls			Intervention		
		N	<i>M</i>	<i>SD</i>	N	<i>M</i>	<i>SD</i>
<b>Inhibition</b>							
Shape Task: Errors	PRE	41	5.17	4.67	44	6.59	5.15
	POST	40	3.90	2.27	45	3.36	2.07
Arrow Task: Errors	PRE	40	6.75	4.85	45	7.78	4.90
	POST	40	4.68	3.20	46	4.52	1.99
Boy-Girl Stroop: Errors	PRE	38	3.13	2.58	46	2.96	2.15
	POST	41	2.80	1.98	46	3.07	1.87
GNG: Total Commission Errors	PRE	40	3.45	2.86	46	4.07	2.81
	POST	39	2.95	1.97	46	3.37	2.02
<b>Working Memory</b>							
BDS: Total Correct	PRE	41	2.24	1.20	46	1.89	1.25
	POST	41	2.44	1.05	46	2.46	1.07
BWS: Total Correct	PRE	40	2.73	1.26	46	2.11	1.23
	POST	41	2.59	1.20	46	2.78	0.89
Jack-in-Box: Mean Total Errors	PRE	41	1.46	0.59	46	1.61	0.53
	POST	39	1.42	0.56	46	1.40	0.46
<b>Set-Shifting</b>							
Animal Color: Completion Time	PRE	40	38.88	7.70	46	42.04	8.91
	POST	41	37.61	8.59	46	36.87	7.08
Color-Shape: Completion Time	PRE	41	37.59	7.70	44	35.61	9.78
	POST	39	32.54	7.63	45	31.56	6.98
Progressive Figures: Completion Time	PRE	39	58.44	30.34	46	67.61	30.47
	POST	40	42.45	20.07	45	46.49	17.72

Table 4. PRE represent data collected at baseline, POST indicates data collected after the intervention. GNG = Go/No-Go task. BDS = Backwards Digit Span task; BWS = Backwards Word Span task; Jack-in-Box = values represent mean total within and between errors.

### *Confirmatory Factor Analyses*

#### *Inhibition*

A confirmatory factor analysis was run on the pre-intervention (baseline) and post-intervention inhibition data. See Table 5 for correlations among the inhibition variables. As can be seen in this table, all correlations were significant with the exception of most of the go/no-go variables, which only correlated significantly with some of the post-intervention data. Regardless, the go/no go variables were still used in the confirmatory factor analyses to examine the impact of this variable on inhibitory changes from baseline to post-intervention. For the SEM analysis, the model was scaled through

fixing one indicator measure to 1.0 for each factor. According to conventions associated with the model fit criteria described above, the overall fit of the two factor model was good,  $\chi^2 = 14.40$ ,  $df = 15$ ,  $p = .495$ , CFI = 1.00, RMSEA = .000 (LO.000, HI .098),  $\chi^2/df$  ratio = .96. All but the post-intervention go/no-go indicator (critical ratio = 1.42,  $p = .16$ ) loaded significantly onto their corresponding pre- or post- latent inhibition constructs with critical ratios ranging from 2.02 to 3.72 (all  $ps < .05$ ). As can be seen from Figure 1, standardized regression weights ranged from .18 to .68. The post-intervention go/no-go indicator was left in the model in order to later examine group effects and preserve the change over time points. Note that circles represent latent components, while rectangles represent measured inhibition variables (i.e., error data for pre-intervention and post-intervention shapes, arrows, boy-girl stroop, and go/no-go tasks). Small circles represent error variance, double-headed curved arrows represent covariance, and single headed arrows represent shared variance contributing to each latent component.

Table 5

*Correlations for Inhibition Indicator Variables*

Variable	PRE Shape	PRE Arrow	PRE Stroop	PRE GNG	POST Shape	POST Arrow	POST Stroop	POST GNG
PRE Shape	1.00							
PRE Arrow	.36**	1.00						
PRE Stroop	.28*	.45**	1.00					
PRE GNG	.13	.20	.13	1.00				
POST Shape	.39**	.27*	.36**	.17	1.00			
POST Arrow	.28*	.41**	.38**	.22*	.42**	1.00		
POST Stroop	.24*	.36**	.33**	.27*	.32**	.35**	1.00	
POST GNG	.19	.09	-.01	.08	.22*	.01	.18	1.00

*Note.* \*\*Correlation significant at the .01 level. \*Correlation significant at the .05 level. All variables represent error data.

Figure 1

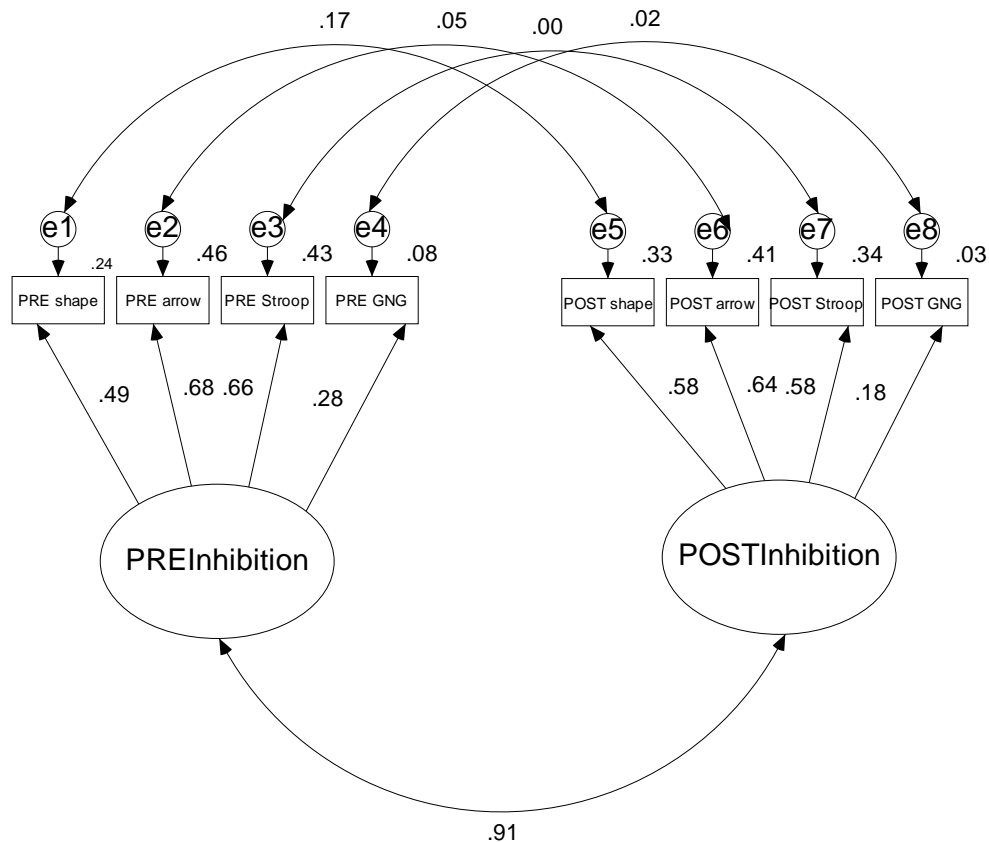


Figure 1. Shape = errors for inhibition trial of Shape task; Arrow = errors for inhibition trial of Arrow task; Stroop = errors for Boy Girl Stroop task, GNG = total commission errors.

### *Working Memory*

A confirmatory factor analysis was run on the pre-intervention (baseline) and post-intervention working memory (WM) data. See Table 6 for correlations among the WM variables. The WM model that was run can be seen in Figure 2 below. The model was scaled through fixing one indicator measure to 1.0 for each factor. According to conventions associated with the model fit criteria described above, the overall fit of the two factor measurement model was good,  $\chi^2 = 4.78$ ,  $df = 5$ ,  $p = .443$ , CFI = 1.00, RMSEA = .000 (LO.000, HI .147),  $\chi^2/df$  ratio = .96. All but the post-intervention Jack-

in-the-Box indicator (critical ratio = -1.79,  $p = .07$ ) loaded significantly onto their corresponding pre- or post- latent working memory constructs with critical ratios ranging from -2.54 to 3.02 (all  $ps \leq .01$ ). As can be seen from Figure 2, standardized regression weights ranged from -.24 to .82. The post-intervention Jack-in-the-Box indicator was left in the model in order to later examine group effects and preserve this change over time points.

Table 6

*Correlations for Working Memory Indicator Variables*

Variable	PRE BDS	PRE BWS	PRE Box	POST BDS	POST BWS	POST Box
PRE BDS	1.00					
PRE BWS	.56**	1.00				
PRE Box	-.31**	-.24*	1.00			
POST BDS	.55**	.43**	-.16	1.00		
POST BWS	.39**	.37**	-.26*	.46**	1.00	
POST Box	-.22*	-.12	.36**	-.20	-.07	1.00

*Note.* \*\*Correlation significant at the .01 level. \*Correlation significant at the .05 level. BDS = Backwards Digit Span; BWS = Backwards Word Span. Box = Jack-in-Box total mean errors.

Figure 2

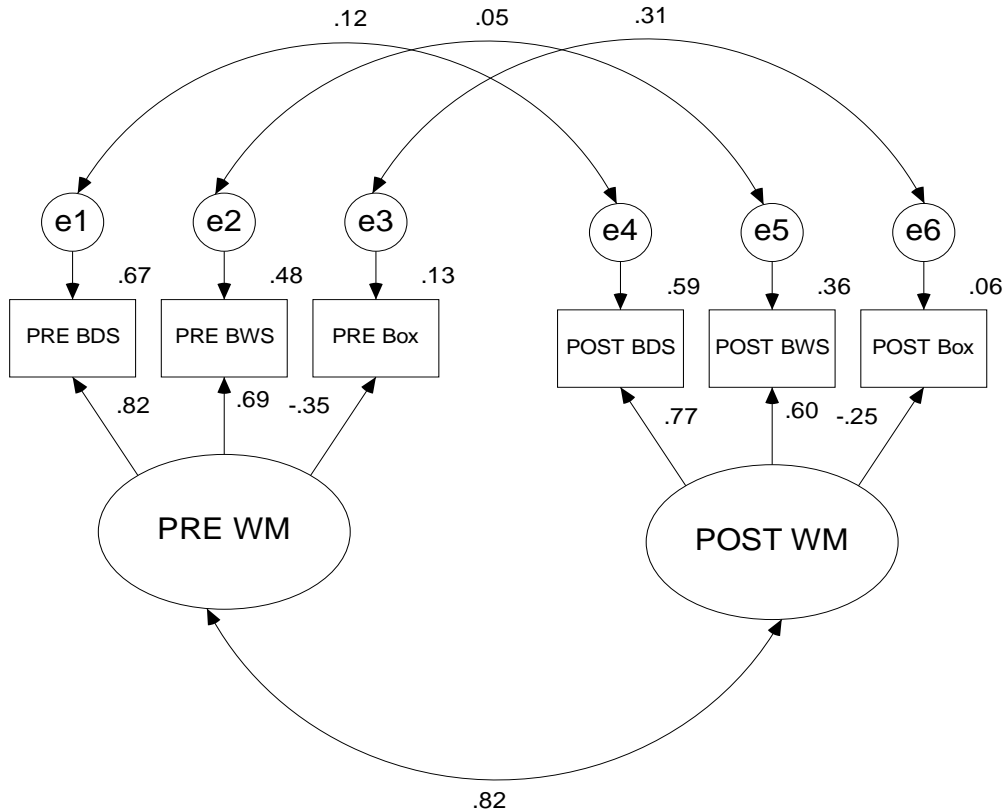


Figure 2. BDS = Backwards Digit Span; BWS = Backwards Word Span; BOX = Jack-in-the-Box.

### *Set-Shifting/Mental Flexibility*

A confirmatory factor analysis was run on the pre-intervention (baseline) and post-intervention set-shifting (SS) data. See Table 7 for correlations among the SS variables. The SS model that was run can be seen in Figure 3 below. In addition to the model being scaled through fixing one indicator measure to 1.0 for each factor, an additional constraint was added to the model through fixing the covariance of error term e1 to 0 (to control for negative variance). According to conventions associated with the model fit criteria described above, the overall fit of the two factor measurement model was good,  $\chi^2 = 3.26$ ,  $df = 6$ ,  $p = .776$ , CFI = 1.00, RMSEA = .000 (LO.000, HI .094),

$\chi^2/df$  ratio = .54. All SS indicators loaded significantly onto their corresponding pre- or post- latent SS constructs with critical ratios ranging from 2.93 to 7.14 (all  $ps < .01$ ). As can be seen from Figure 3, standardized regression weights ranged from .32 to 1.00.

Table 7  
Correlations for Set-shifting Indicator Variables

Variable	PRE AC	PRE PF	PRE CS	POST AC	POST PF	POST CS
PRE AC	1.00					
PRE PF	.30**	1.00				
PRE CS	.62**	.22*	1.00			
POST AC	.64**	.22*	.35**	1.00		
POST PF	.19	.48**	.18	.35**	1.00	
POST CS	.52**	.17	.47**	.59**	.19	1.00

Note. \*\*Correlation significant at the .01 level. \*Correlation significant at the .05 level. AC = Animal Color task; PF = Progressive Figures task; CS = Color Shape task. All variables represent total completion time.

Figure 3

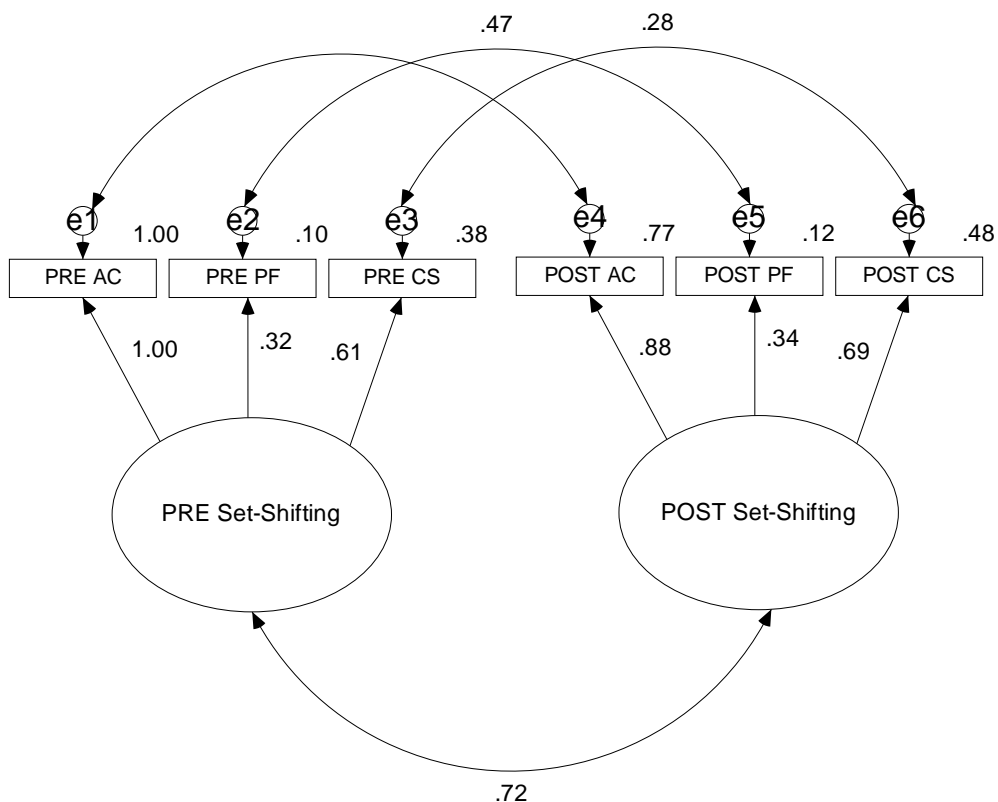


Figure 3. All indicator variables represent completion time data in seconds. AC = Animal-Color task; PF = Progressive Figures task; CS = Color-Shape task.

### *SEM Models*

SEM analyses were run to examine direct effects of group membership on the three EF latent constructs (tests of hypothesis 2), and indirect (mediator) effects of group membership on social-emotional and behavioural outcome measures (tests of hypothesis 3) using the steps outlined above according to Hayes (2009). The first step was to examine the direct effects of group membership on the three EF latent constructs. The second step was to examine and test for the presence of mediation effects of the three EF latent constructs on each of the three dependent variables where regression analyses revealed significant intervention effects (i.e., observed positive social behaviours, observed negative social behaviours, and social cognitive skills). As noted above, baseline or pre-intervention scores for these three outcome measures were excluded from the SEM models as covariates as none of the baseline scores accounted for a significant amount of variance in the post-intervention outcome measures.

### *Inhibition Mediator Models*

The first three models examined direct effects of group membership on the latent inhibition construct in addition to examining the presence of a mediation effect of inhibition on post-intervention effects of observed positive social behaviours, observed negative social behaviours, and social cognitive skills. The baseline scores for the outcome variables were not included in any of the models as the initial regression analyses revealed insignificant relationships between pre-intervention and post-intervention scores on the CST, observed positive social behaviours, and observed negative social behaviours. All models were scaled through fixing one indicator measure to 1.0 for each factor. An additional constraint was added to the models through fixing

the covariance between errors e3 and e7 to 0 (to control for negative variance). The first model run was for social cognitive skills (i.e., performance on the CST), shown in Figure 4 below. According to conventions associated with the model fit criteria described above, the overall fit of the measurement model was good,  $\chi^2 = 26.49$ ,  $df = 30$ ,  $p = .650$ , CFI = 1.00, RMSEA = .000 (LO.000, HI .069),  $\chi^2/df$  ratio = .883. Consistent with the initial regression analysis, the pathway between group membership and performance on the CST was significant. The critical ratio was 9.40 ( $p < .01$ ) and the standardized regression weight was .71.

The next step was to determine if a significant relationship between the independent variable/predictor and the mediator exists (i.e., to examine the direct effect of group membership on the latent post-intervention inhibition construct). The critical ratio was -.96 ( $p = .34$ ) and the standardized regression weight was -.10, indicating no significant relationship between group membership and the latent inhibition construct. Specifically, no significant intervention effect was found for the post-intervention latent inhibition construct after controlling for pre-intervention latent inhibition construct values.

Given that criteria for mediation effects require a significant relationship to exist between the independent variable and the mediator variable, the analysis for this model ended here, as this criterion was not met.

Figure 4

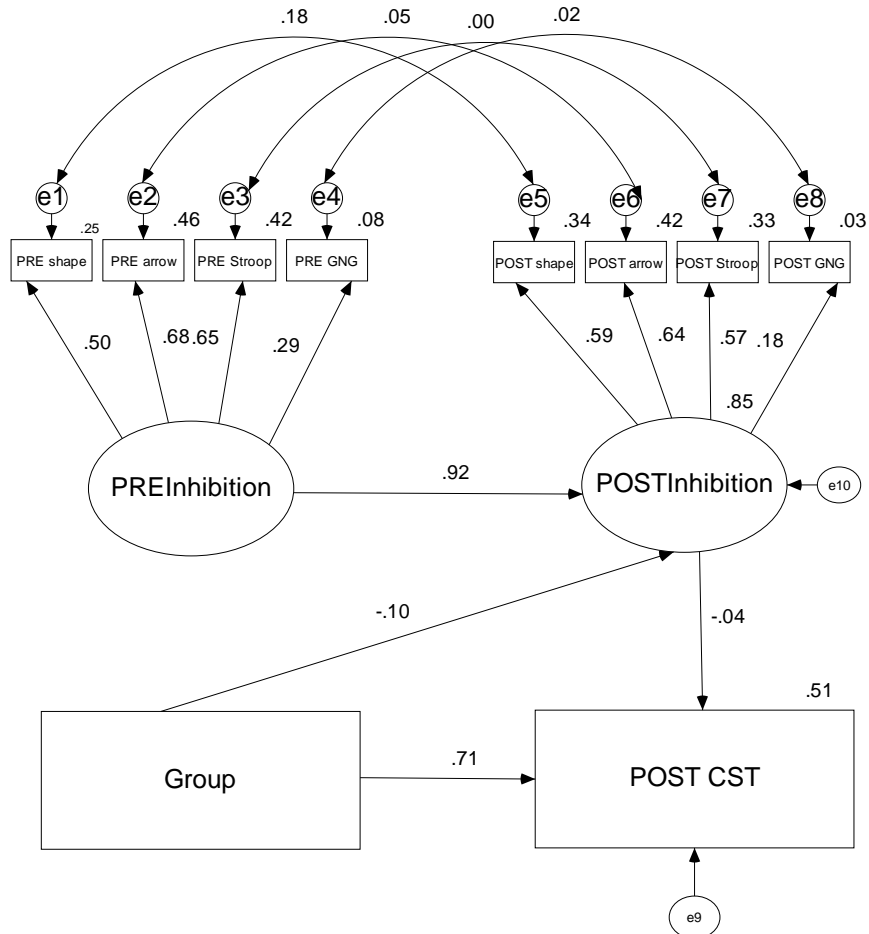


Figure 4. Shape = errors for inhibition trial of Shape task; Arrow = errors for inhibition trial of Arrow task; Stroop = errors for Boy Girl Stroop task; GNG = total commission errors for Go/no Go task. Group was coded 1 for controls, 2 for intervention. CST = total score on the Challenging Situations Task.

The second model run was for observed positive social behaviours post-intervention, shown in Figure 5 below. According to conventions associated with the model fit criteria described above, the overall fit of the measurement model was adequate,  $\chi^2 = 36.94$ ,  $df = 30$ ,  $p = .179$ , CFI = .93, RMSEA = .052 (LO.000, HI .101),  $\chi^2/df$  ratio = 1.231. Consistent with the initial regression analysis, the pathway between group membership and observed positive social behaviors was significant. The critical ratio was 1.87 ( $p < .01$ ) and the standardized regression weight was .34. The next step

revealed no significant relationship between the group membership and the latent post-inhibition component. The critical ratio was  $-.97$  ( $p = .332$ ) and the standardized regression weight was  $-.10$ . Therefore the analysis was again ended here, as mediation criteria were not met.

Figure 5

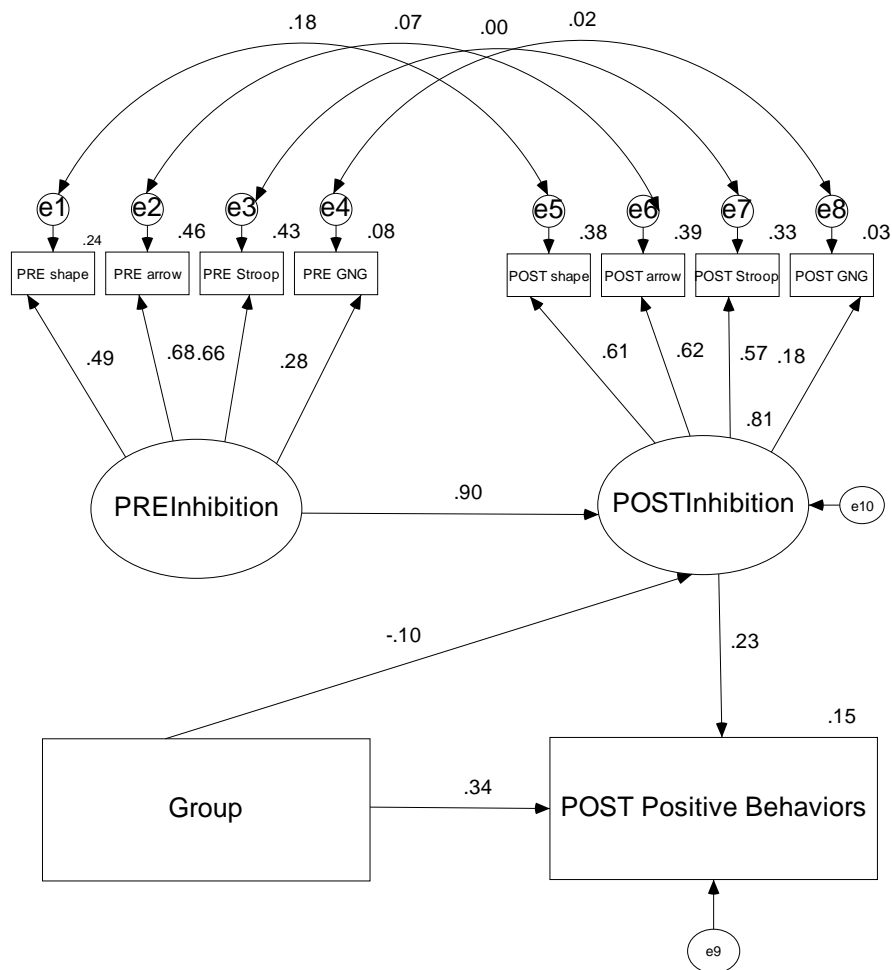


Figure 5. Shape = errors for inhibition trial of Shape task; Arrow = errors for inhibition trial of Arrow task; Stroop = errors for Boy Girl Stroop task; GNG = total commission errors for Go/no Go task. Group was coded 1 for controls, 2 for intervention. Positive Behaviours = Mean total observed positive social behaviours from both raters.

The third model run was for observed negative social behaviours post-intervention, shown in Figure 6 below. According to conventions associated with the

model fit criteria described above, the overall fit of the measurement model was good,  $\chi^2 = 30.42$ ,  $df = 30$ ,  $p = .445$ , CFI = .995, RMSEA = .013 (LO.000, HI .083),  $\chi^2/df$  ratio = 1.014. Consistent with the initial regression analysis, the pathway between group membership and observed positive social behaviors was significant. The critical ratio was -1.93 ( $p = .05$ ) and the standardized regression weight was -.20. The next step revealed no significant relationship between the group membership and the latent post-inhibition component. The critical ratio was -1.00 ( $p = .32$ ) and the standardized regression weight was -.11. Therefore the analysis was again ended here, as mediation criteria were not met.

Figure 6

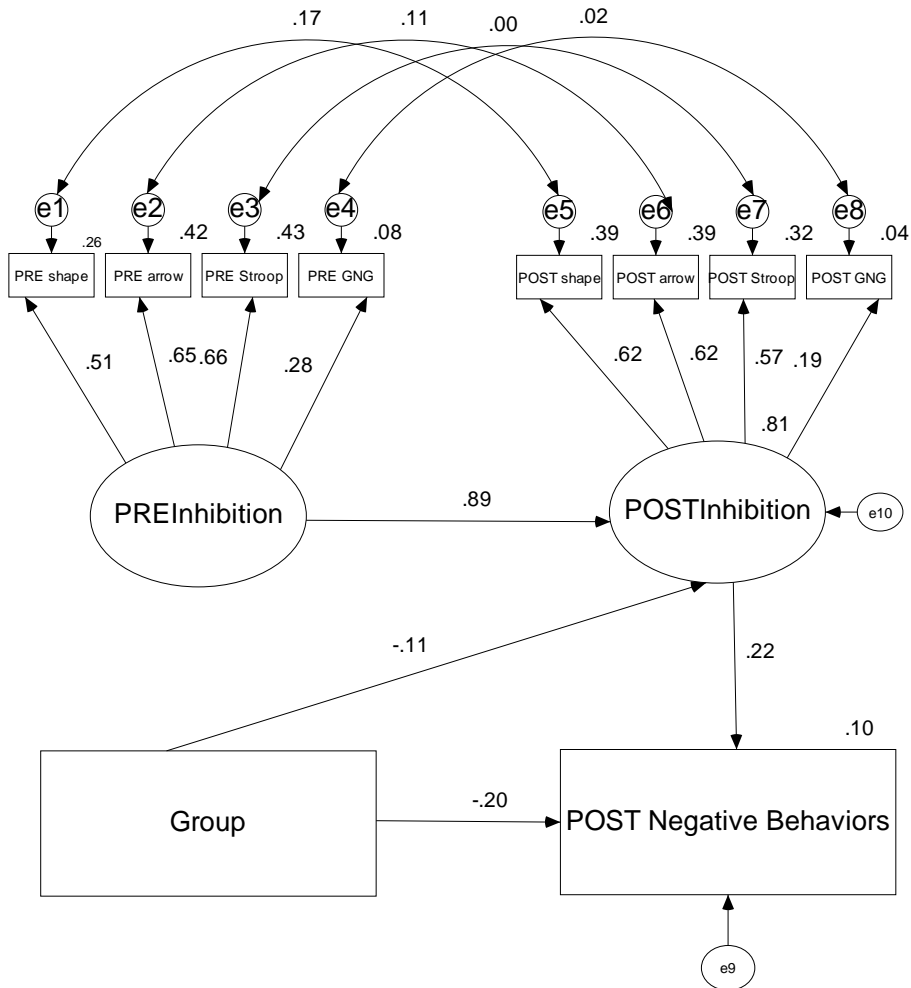


Figure 6. Shape = errors for inhibition trial of Shape task; Arrow = errors for inhibition trial of Arrow task; Stroop = errors for Boy Girl Stroop task; GNG = total commission errors for Go/no Go task. Group was coded 1 for controls, 2 for intervention. Negative Behaviours = Mean total observed negative social behaviours from both raters.

### *Working Memory Mediator Models*

The next three models examined direct effects of group membership on the latent WM construct in addition to examining the presence of a mediation effect of working memory (WM) on post-intervention effects of observed positive social behaviours, observed negative social behaviours, and social cognitive skills.. The baseline scores again were not included in any of the models as the initial regression analyses revealed

insignificant relationships between pre-intervention and post-intervention scores on the CST, observed positive social behaviours, and observed negative social behaviours. All models were scaled through fixing one indicator measure to 1.0 for each factor. An additional constraint was added to the first two models (models 4 and 5) through fixing the covariance between errors e2 and e5 to 0 (to control for negative variance).

The fourth model run was for social cognitive skills (i.e., performance on the CST), shown in Figure 7 below. According to conventions associated with the model fit criteria described above, the overall fit of the measurement model was good,  $\chi^2 = 14.88$ ,  $df = 16$ ,  $p = .534$ , CFI = 1.00, RMSEA = .000 (LO.000, HI .093),  $\chi^2/df$  ratio = .930. As it was already determined from previous analyses that a significant relationship between group membership and performance on the CST exists, the first step was to examine the direct effect of group membership on the post-intervention latent WM construct. The critical ratio was 2.17 ( $p = .03$ ) and the standardized regression weight was .23, indicating a significant relationship (at criteria  $p < .05$ ). This positive significant relationship between group membership and the post-intervention WM latent construct (i.e., a significant direct effect between group membership and the latent WM construct), indicated that participation in the First Friends intervention was predictive of better performance (i.e., higher values) on the WM latent construct.

The next step in the mediation analyses was to examine if there was a significant relationship between the mediator and the dependent variable (i.e., between the post-WM latent construct and the post-intervention performance on the CST). Here, the critical ratio was 1.50 ( $p = .14$ ) and the standardized regression weight was .14, indicating no significant relationship, thus the analysis for a mediator effect ended here.

Figure 7

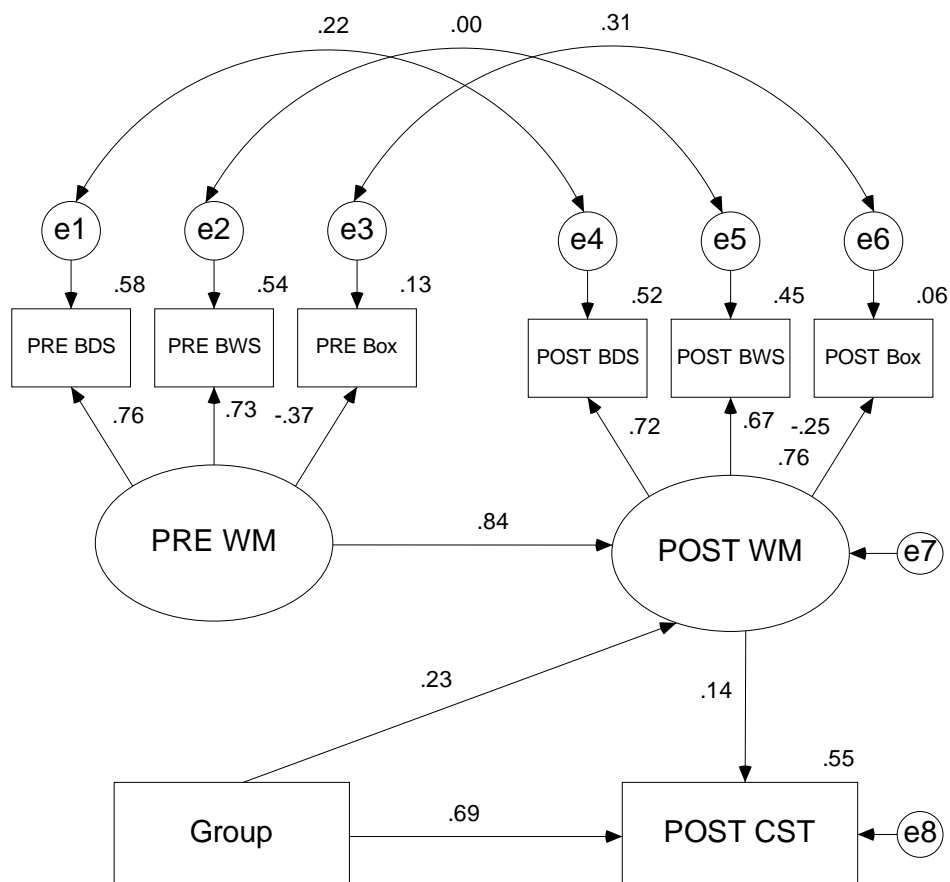


Figure 7. BDS = Backwards Digit Span; BWS = Backwards Word Span; BOX = Jack-in-the-Box. Group was coded 1 for controls, 2 for intervention. CST = total score on the Challenging Situations Task.

The fifth model run was for observed positive social behaviours post-intervention, shown in Figure 8 below. According to conventions associated with the model fit criteria described above, the overall fit of the measurement model was adequate,  $\chi^2 = 21.26$ ,  $df = 16$ ,  $p = .169$ , CFI = .953, RMSEA = .062 (LO.000, HI .125),  $\chi^2/df$  ratio = 1.329. The relationship between group membership and the mediator (WM latent component) was still significant, revealing a critical ratio of 2.22 ( $p < .05$ ) and a standardized regression weight of .23. An examination of the relationship between the post-WM latent construct

and the post-intervention observed positive social behaviours revealed a critical ratio of  $-.34$  ( $p = .73$ ) and the standardized regression weight of  $-.05$ , indicating no significant relationship, thus the analysis for a mediator effect ended here.

Figure 8

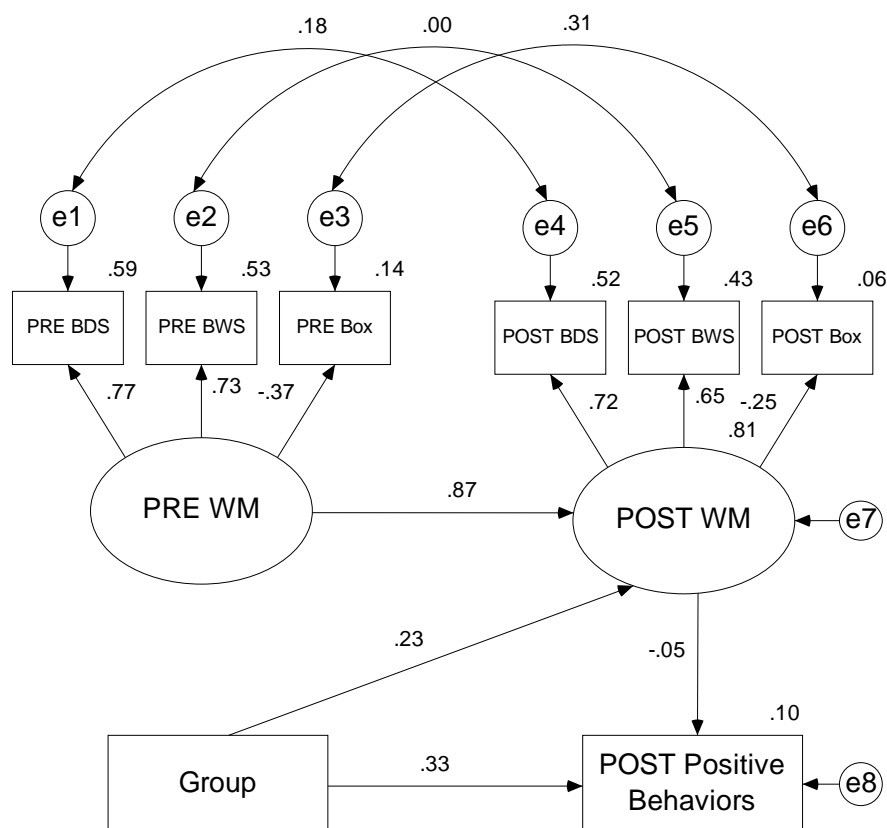


Figure 8. BDS = Backwards Digit Span; BWS = Backwards Word Span; BOX = Jack-in-the-Box. Group was coded 1 for controls, 2 for intervention. Positive Behaviours = Mean total observed positive social behaviours from both raters.

The sixth model run was for observed negative social behaviours post-intervention, shown in Figure 9 below. According to conventions associated with the model fit criteria described above, the overall fit of the measurement model was good,  $\chi^2 = 13.31$ ,  $df = 15$ ,  $p = .58$ , CFI = 1.00, RMSEA = .000 (LO.000, HI .091),  $\chi^2/df$  ratio = .888. The relationship between group membership and negative social behaviors was

significant (critical ratio = -2.00,  $p < .05$ ) and the standardized regression weight was -.21. The relationship between group membership and the mediator (WM latent component) was still significant, revealing a critical ratio of 2.19 ( $p < .05$ ) and the standardized regression weight was .23. An examination of the relationship between the post-WM latent construct and the post-intervention observed negative social behaviours revealed a critical ratio of -.53 ( $p = .59$ ) and the standardized regression weight of -.07, indicating no significant relationship, thus the analysis for a mediator effect ended here.

Figure 9

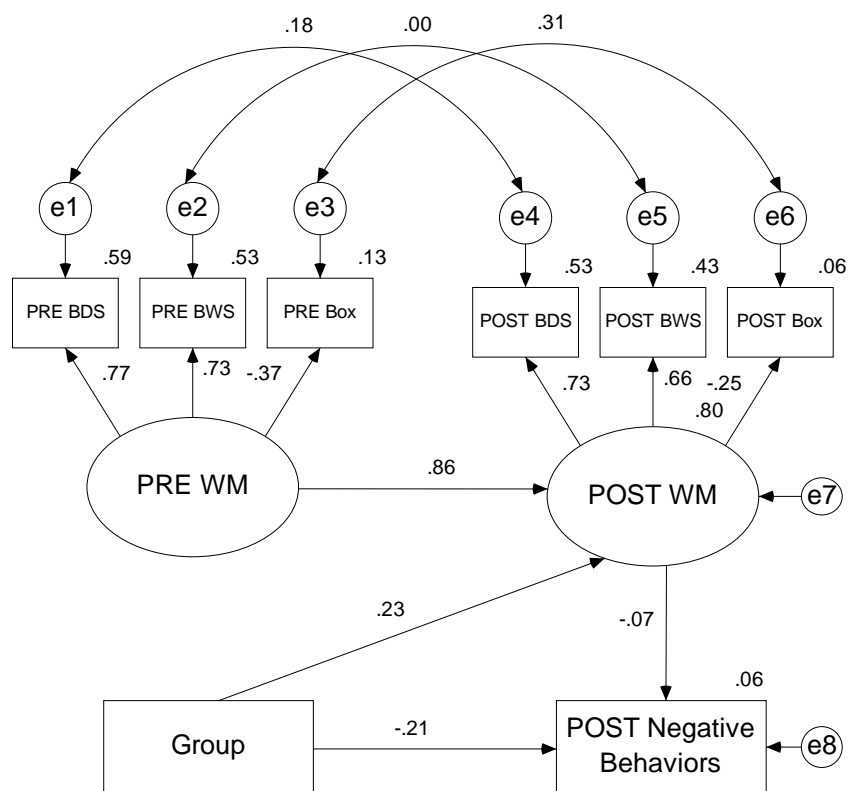


Figure 9. BDS = Backwards Digit Span; BWS = Backwards Word Span; BOX = Jack-in-the-Box. Group was coded 1 for controls, 2 for intervention. Positive Behaviours = Mean total observed negative social behaviours from both raters.

*Set-Shifting Mediator Models*

The final three models examined direct effects of group membership on the latent SS construct in addition to examining the presence of a mediation effect of set-shifting (SS) on post-intervention effects of observed positive social behaviours, observed negative social behaviours, and social cognitive skills. The baseline scores again were not included in any of the models as the initial regression analyses revealed insignificant relationships between pre-intervention and post-intervention scores on the CST, observed positive social behaviours, and observed negative social behaviours. All models were scaled through fixing one indicator measure to 1.0 for each factor. Two additional constraints were added to these models through fixing the covariance of error terms e1 and e4 and to 0 (to control for negative variance). The seventh model run was for social cognitive skills (i.e., performance on the CST), shown in Figure 10 below. According to conventions associated with the model fit criteria described above, the overall fit of the measurement model was adequate,  $\chi^2 = 23.64$ ,  $df = 18$ ,  $p = .167$ , CFI = .97, RMSEA = .060 (LO.000, HI .120),  $\chi^2/df$  ratio = 1.31. As it was already determined from the first mediation model that a significant relationship between group membership and performance on the CST exists, the first step to determine a mediator effect in this model is to examine the relationship between group membership and the mediator (the latent post-intervention SS component). The critical ratio was -2.04 ( $p = .04$ ) and the standardized regression weight was -.16, indicating a significant relationship (at criteria  $p < .05$ ). This negative significant relationship between group membership and the post-intervention SS latent construct (i.e., a significant direct effect between group membership and the latent SS construct), indicated that participation in the First Friends

intervention was predictive of better performance on the SS latent construct (i.e., lower values indicative of faster completion time overall).

The next step in the mediation analyses was to examine if there was a significant relationship between the post-SS latent construct and post-intervention performance on the CST. Here, the critical ratio was .63 ( $p = .53$ ) and the standardized regression weight was .05, indicating no significant relationship, thus the analysis for a mediator effect ended here.

Figure 10

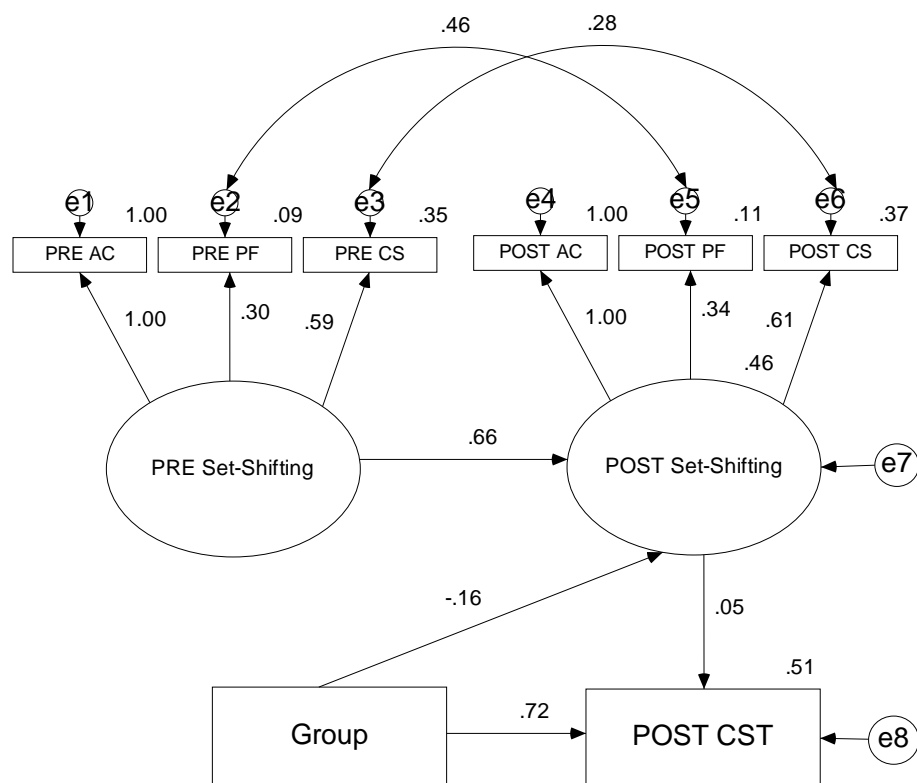


Figure 10. All indicator variables represent completion time data in seconds. AC = Animal-Color task; PF = Progressive Figures task; CS = Color-Shape task. Group was coded 1 for controls, 2 for intervention. CST = total score on the Challenging Situations Task.

The eighth model run was for observed positive social behaviours post-intervention, shown in Figure 11 below. According to conventions associated with the

model fit criteria described above, the overall fit of the measurement model was good,  $\chi^2 = 20.93$ ,  $df = 18$ ,  $p = .28$ , CFI = .98, RMSEA = .043 (LO.000, HI .109),  $\chi^2/df$  ratio = 1.16. The relationship between group membership and the latent post-intervention SS mediator again revealed a critical ratio of -2.04 ( $p = .04$ ) and the standardized regression weight was -.16, indicating a significant relationship (at criteria  $p < .05$ ). Examination of the relationship between the post-SS latent construct and post-intervention observed positive social behaviours revealed a critical ratio of -.43 ( $p = .67$ ) and the standardized regression weight was -.04, indicating no significant relationship, thus the analysis for a mediator effect ended here.

Figure 11

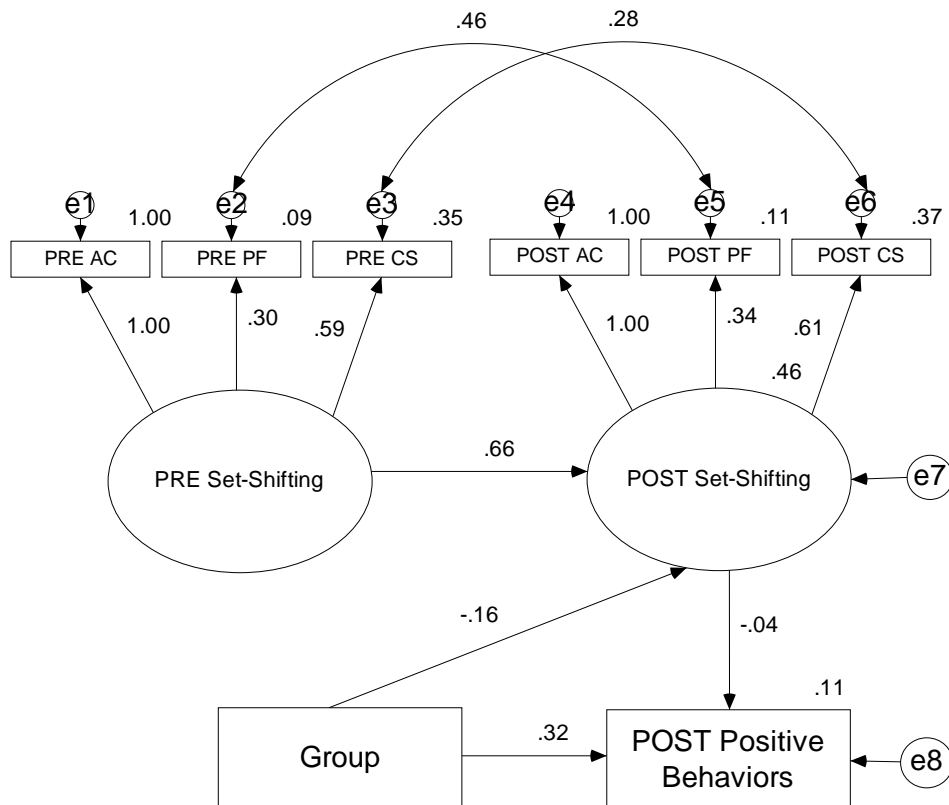


Figure 11. All indicator variables represent completion time data in seconds. AC = Animal-Color task; PF = Progressive Figures task; CS = Color-Shape task. Group was coded 1 for controls, 2 for intervention. Positive Behaviors = Mean total observed positive social behaviours from both raters.

The final ninth model run was for observed negative social behaviours post-intervention, shown in Figure 12 below. According to conventions associated with the model fit criteria described above, the overall fit of the measurement model was poor,  $\chi^2 = 32.17$ ,  $df = 18$ ,  $p = .02$ , CFI = .92, RMSEA = .096 (LO.037, HI .148),  $\chi^2/df$  ratio = 1.79. The relationship between group membership and negative social behaviors was significant (critical ratio = -2.03,  $p < .05$ ) and the standardized regression weight was -.22. The relationship between group membership and the latent post-intervention SS mediator again revealed a critical ratio of -2.04 ( $p = .04$ ) and the standardized regression weight was -.16, indicating a significant relationship (at criteria  $p < .05$ ). Examination of the relationship between the post-SS latent construct and post-intervention observed negative social behaviours revealed a critical ratio of -.24 ( $p = .81$ ) and the standardized regression weight was -.03, indicating no significant relationship, thus the analysis for a mediator effect ended here.

Figure 12

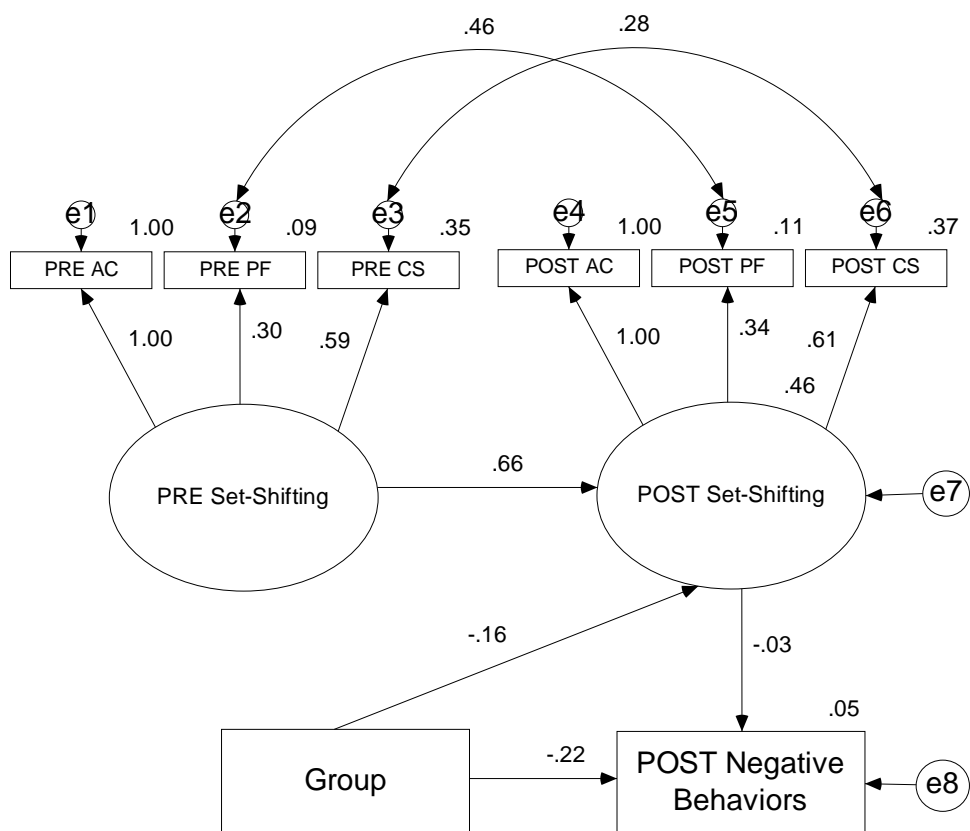


Figure 12. All indicator variables represent completion time data in seconds. AC = Animal-Color task; PF = Progressive Figures task; CS = Color-Shape task. Group was coded 1 for controls, 2 for intervention. Negative Behaviours = Mean total observed negative social behaviours from both raters.

In summary, the results of the SEM mediator models revealed significant intervention effects for latent working memory and set-shifting factors, but no significant intervention effect for the inhibition latent factor. In addition, none of the models revealed significant mediator effects for any of the EF latent constructs.

## Discussion

The current study examined the effectiveness of a novel preventive intervention program, First Friends (Graham, 2000; 2006), aimed at improving social and emotional

competency in kindergarten aged children from at-risk, socioeconomically disadvantaged areas of the Greater Victoria region. The eight-week First Friends intervention was designed to teach children several social-emotional skills and strategies, including identifying feelings, empathy, assertiveness, anger management, conflict resolution, caring and nurturing, planning and decision making, and self-esteem.

The results of the current study provided partial support for the first hypothesis, which held that the First Friends preventive intervention would significantly improve levels of social-emotional, social-cognitive, and coping skills, and significantly decrease problem behaviours compared to control group children. Specifically, the current study results revealed that children who participated in the First Friends intervention demonstrated more positive social behaviours and less negative social behaviours (i.e., problem behaviours) compared to children in the control group, according to observers blind to group assignment. Children were observed during social interactions with their classmates or similar-aged peers, and raters chose similar times of day and social activities to observe the children for pre- and post-intervention ratings. Ratings revealed that on average, children who participated in the intervention demonstrated approximately one less negative behaviour, and one more positive behaviour during this two minute observation period, compared to children in the control group, whose behaviours did not change significantly over time. Although at first glance these numbers appear small, given the short time frame in which these children were observed, these behaviours represent a significant improvement between baseline and post-intervention observations. To put these numbers into perspective, the participating kindergarten children spent approximately 3 hours each day in the classroom. If one more or one less

behaviour is exhibited in a two minute period, this can represent up to 90 additional positive or 90 fewer negative behaviours demonstrated over the course of one kindergarten day. When looking at the intervention effects, 10.7% of the variance in positive social behaviours, and 5.3% of the variance in negative social behaviours were accounted for by the First Friends intervention. These results are consistent with previous results assessing the First Friends intervention in both preschool and kindergarten samples (Graham, 2000; 2006).

In addition, children who participated in the First Friends intervention demonstrated significantly better performance on a measure of social-emotional and social-cognitive skills (i.e., the Challenging Situations Task), compared to children in the control group. The children who participated in the First Friends intervention were better able to accurately identify facial expressions of emotion in same gender children, and to identify positive or prosocial solutions to challenging social situations, compared to children in the control group. Specifically, a noteworthy 51.4% of the variance on the Challenging Situations Task (evaluating social emotional and social cognitive skills) was accounted for by the intervention. The above results support the efficacy of the First Friends intervention in promoting positive social behaviours and social-emotional and social-cognitive skills, and decreasing negative social behaviours in this sample of kindergarten children.

In contrast, teacher and parent rating measures of social skills, problem behaviours, and coping skills did not reveal significant differences between the groups. There are several possible reasons for these results. Parent measures rating social skills, problem behaviours, and coping skills required that parents had opportunities to observe

their children in social interactions with others. It is possible that some parents may not have had opportunities to observe their children in a range of social situations, thus decreasing their ability to accurately identify differences in their children on these measures. This may have been a particular problem with regards to the coping skills measure, where parents were required to identify and rate how their children would react or cope in very specific situations, some of which they may have never observed, or may have not had the opportunity for any comparison if the situation did not occur between pre-intervention and post-intervention ratings. With regards to the ratings of social skills and problem behaviours on the PKBS-2, completed by both parents and teachers, the scale of the measure may have been a problematic factor. Specifically, the PKBS-2 provides the option to rate specific behaviours for children as never, sometimes, or often occurring. The lack of a higher rating, such as “almost always” or “always”, may have restricted the range of ratings, as several parents and teachers rated children in the highest category at baseline, particularly with regards to the social skills items. A distinction between a rating of “often” and a rating such as “almost always” may have helped to separate out those children whose social skills had improved from those who were more developed at post-intervention.

It is possible that having the skills learned within the intervention group also taught and emphasized by classroom teachers and parents may have strengthened program effects. Particularly for children who demonstrated more problem behaviours and fewer social skills, more intensive intervention within multiple environments (i.e., group, school and home), may have served to improve efficacy with regards to social, emotional, and behavioural outcomes. Intervention across environments through parent

and teacher implementation may have improved the ability to catch children during teachable moments and train these skills more consistently. As noted earlier, the decision to maintain the direct teaching approach, with teachers and parents blind to group assignment, was based on scientific considerations, and served to strengthen the reliability and validity of parent and teacher report. This method excluded the possibility of “halo” effects, which cannot be ruled out when having the teaching responsibility of these skills placed on the same parents and teachers who later rate the behaviour. As such, it remains an empirical question as to whether expanding the intervention to include both teachers and parents in implementing strategies at home and within the classroom improves the efficacy of the intervention or merely the parent and teacher report of the behaviour.

The second hypothesis of the current study was that the First Friends preventive intervention would promote gains in EF, as shown by significant intervention effects on the latent EF factors (inhibition, working memory, and set-shifting). This hypothesis was based on the notion that the social and emotional skills taught and practiced throughout the First Friends intervention appeared to require EF skills. Therefore, the First Friends intervention (unintentionally) incorporated elements of EF, thus serving to strengthen particular EF skills in children who learned and practiced the social strategies taught within the groups. Additionally, research has shown that overlapping brain pathways are utilized in carrying out both social and executive skills. Therefore, strengthening pathways that target social skills should also serve to indirectly strengthen EF skills as they utilize overlapping brain regions and pathways.

The current study provided some support for this hypothesis. Specifically, participation in the First Friends intervention was predictive of significantly stronger performance on the working memory latent construct compared to children in the control group, after controlling for the baseline or pre-intervention WM latent construct value. As noted above, it is theorized that the repetitive practice of specific poems and statements taught to children in the intervention groups in order to strengthen and facilitate recall of specific social and coping strategies required the use of working memory skills. Children were required to hold these strategies in mind and to utilize them during free play, which requires a working memory component, thus perhaps serving to strengthen working memory performance between pre- and post-working memory latent construct values.

In addition, participation in the First Friends intervention was predictive of significantly stronger performance on the set-shifting latent construct compared to children in the control group, after controlling for the baseline or pre-intervention set-shifting latent construct value. This result is consistent with the study by Bierman and colleagues (2008) that found marginally significant intervention effects of their Head Start REDI program on 4-year-old children's performance on a dimensional change card sort task, which is a measure of attention set-shifting and flexibility. It should be noted here that the current study results are particularly compelling given that the Head Start REDI program is a year-long intensive intervention, whereas the current study demonstrated significant intervention effects on two latent EF constructs with an 8-week program targeted solely towards social-emotional and social cognitive functioning. During the First Friends groups, children were required to flexibly shift attention from one child to the next during circle time, and flexibly shift attention from one activity to

the next when transitioning from circle time, to free play, then again back to circle time. It is theorized that the transitional preparation strategies (e.g., warnings, choices) combined with varying tasks and activities requiring shifting focus and attention may have served to both target and improve set-shifting and mental flexibility skills in the sample of children who participated in the First Friends intervention.

Overall, these results are compelling and suggest that a short-term 8-week intervention targeted solely towards improving social and emotional skills can also more broadly improve other cognitive functions such as EF which appear to be required in the learning and implementation of social-emotional skills. Future research should continue to examine the efficacy of interventions with early childhood populations and socioeconomically disadvantaged populations in order to identify what tools and strategies are the most broad-reaching and effective in facilitating the development of both social and executive functioning skills in young children.

Despite significant intervention effects on working memory and set-shifting latent constructs, the current study failed to support the hypothesis that the First Friends intervention would lead to changes on the inhibition latent construct. These results are contrary to those obtained by Riggs and colleagues (2006) who found the PATHS curriculum successful in promoting inhibitory control in a sample of typically developing 7 to 9 year old children (second and third graders). It is possible that children from socioeconomically disadvantaged areas may require more intensive intervention, or more specific interventions targeted towards improving inhibition in order to successfully facilitate inhibition in these populations. It should be noted that there is still limited research in this area, and the research that does exist provides limited evidence that

inhibitory control can be improved through intervention programs in both normal and pathological samples (Ciairano et al., 2007). Several recent studies that have examined the effects of training programs on improving inhibitory control have resulted in inconsistent results. For example, studies using cognitive training intervention approaches have found beneficial effects on executive functions. Specifically, the curricular intervention, Tools of the Mind (Diamond et al., 2007), and computer-based executive attention training (Rueda, Rothbart, McCandliss, Saccomanno, & Posner, 2005; Rueda, Checa, & Santonja, 2008) have resulted in changes in inhibitory control, particularly conflict resolution (not assessed in this study), in early childhood samples. Improvements in inhibitory control have been found in studies with school-aged children with ADHD using attention training programs (Kerns, Eso, & Thompson, 1999) and studies designed specifically to improve working memory (Klingberg, Forsberg, & Westerberg, 2002; Klingberg, Fernell, Olesen, Johnson, Gustafsson, et al., 2005). Of note, none of these previous studies specifically targeted inhibitory control. A recent study (Thorell, Lindqvist, Nutley, Bohlin, & Klingberg, 2009) was the first to specifically target training three important forms of inhibition (i.e., inhibition of a prepotent motor response, stopping of an ongoing response, and interference control) in typically developing preschool children. They used a computerized training program over a 5-week period but failed to find any significant improvements in any form of inhibition in children who underwent the training compared to children in the control group that played video games. Overall, these results suggest that attempts to train and improve inhibition even directly and in different forms can be difficult and lead to inconsistent results.

Importantly, whereas the above interventions or training programs were specifically targeting executive functions, the First Friends intervention aimed to improve social-emotional and social cognitive abilities. Therefore it is possible that in order to significantly improve inhibitory control in an early childhood, socioeconomically disadvantaged population, interventions targeted specifically towards improving inhibition may be warranted. It is clear that this area of investigation is still relatively new, and the inconsistencies in the current literature highlight the need for additional research examining the effects of different interventions on improving inhibition in various early childhood populations in order to clarify what strategies are most effective in facilitating the development of these important skills.

The lack of intervention effects on inhibitory control in the present study might also be explained by methodological discrepancies (i.e., differences in age, socioeconomic status, sample size, specific intervention, length of intervention) when compared to other studies. The current study utilized a novel intervention that was not curriculum based, meaning that children were exposed to intervention strategies less intensely than they would be for curriculum-based interventions. In addition, the study by Riggs and colleagues (2006) was implemented with a typically developing, older sample of children, and thus the results are difficult to compare given the developmental differences in their grade 2 and 3 (ages 7 to 9) sample compared to the sample of kindergarten children (ages 4 to 6) used in the current study. The results in the current study are also consistent with the study by Bierman and colleagues (2008) who did not find a significant intervention effect of their year-long Head Start REDI program on

behavioural inhibition in a sample of socioeconomically disadvantaged 4-year-old children.

It is also possible that the absence of an intervention effect on the latent inhibition construct in this study was related to the lack of change in parent/teacher ratings. While the children in the intervention gained the knowledge to accurately identify prosocial methods of behaving in challenging social situations (as shown by significant improvements on the social-cognitive task), when faced with such real world social challenges or situations, they may not have possessed the inhibitory control to effectively restrain certain behaviours and employ the more socially mature, and effective coping responses they had learned. A recent review by Reuda, Checa, and Rothbart (2010) revealed that better developed or more efficient mechanisms of executive attention, such as interference inhibition and conflict resolution, are related to a better ability to exercise cognitive, emotional, and behavioural regulation, which in turn leads to improved chances at successful socialization.

The last purpose of the current study was to examine the mediational role of different EF latent constructs (i.e., working memory, inhibition, set-shifting/mental flexibility) on the First Friends intervention outcomes. It was hypothesized that gains in EF latent construct values would serve to mediate, or help to explain the relationship between, participation in the First Friends intervention and social outcome measures. Research utilizing the PATHS curriculum provided support for inhibition as a mediator for behavioural outcomes (Riggs et al., 2006). In addition, a significant amount of research has provided evidence for direct concurrent and longitudinal relationships between social and emotional skills and executive functions in early childhood.

Following this, the current study hypothesized that the EF latent constructs would mediate the relationship between group (prevention or control) and intervention outcomes (teacher, parent, and observer social skills and behavioural ratings, and children's social-cognitive task performance). This hypothesis was not supported.

It is possible that the type of inhibition assessed in the current study was not sensitive to the intervention. The literature on cognitive control or inhibition suggests that this construct can be separated into three different areas (e.g., Casey, 2001; Friedman & Miyake, 2004; Nigg, 2006). For example, Nigg (2006) distinguished three aspects of inhibition: mental control (including interference control and cognitive suppression), response inhibition (including interrupting a prepotent response and suppressing any response), and response selection. Similarly, Casey (2001) presented a model of cognitive control where inhibition is also separated into three components (a) stimulus selection (i.e., suppressing responding to, or filtering out, salient, but irrelevant stimulus information); (b) response selection (i.e., selecting an incompatible response while suppressing a competing "prepotent" response); and (c) response execution (i.e., deliberate inhibition of a compelling automatic response). The current study examined response selection (as shown by the latent inhibition factor) and response inhibition (go/no-go task), but perhaps differing forms of inhibitory control (e.g., conflict control) may have led to differing results. Future studies examining the mediation effect of inhibition on social intervention outcomes should examine the differences in inhibitory control more closely to see if specific types of inhibitory control can better account for changes in social, emotional, or behavioural skills.

The hypothesis that the latent constructs of working memory and set-shifting would mediate the relationship between group membership and intervention outcomes was also not supported. To date, no intervention study has supported the role of working memory or set-shifting as mediators in social interventions. However, it should be stated again that this body of research, while rapidly growing, is still young and more research is needed before any conclusive statements can be made about the role of these specific executive functions to social-emotional outcomes.

None of the EF latent constructs examined in the current study significantly mediated the effects between the First Friends intervention and social-emotional and social-cognitive outcomes. It is possible that the type of EF examined in the current study contributed to the lack of mediation effects. Distinctions have been made in the literature between “cold” EF and “hot” EF (see Zelazo & Mueller, 2002). The EFs examined in the current study are considered to be “cold” EF, as they are cognitively based and lack an affective component. These “cold” EFs are typically associated with the lateral prefrontal cortex (Zelazo & Mueller, 2002). “Hot” EF are those functions that contain an affective component (i.e., they involved the regulation of affect and motivation), and are typically associated with the ventral-medial prefrontal cortex (Zelazo & Mueller, 2002). “Cool” EF are more likely to be required for abstract, decontextualized problems, whereas, “hot” EF are required for problems that are characterised by high affective involvement or demand flexible appraisals of the affective significance of stimuli (Zelazo & Mueller, 2002). It is possible that “hot” EFs may have resulted in a different outcome with regards to mediation between the First Friends intervention and social outcomes. Future research should examine the mediational role of both “types” of EF in order to determine if “hot”

EFs are more likely to mediate social-emotional intervention effects compared to “cold” EFs.

No study is without limitations, and the current study is no exception. The sample size of the current study was small, and a larger sample size would have been more ideal, especially with regards to statistics employed. A participant to variable ratio of 5:1 is often considered to be the minimum sample size required to conduct a valid factor analysis (Gorsuch, 1983). The current study fell short of that suggested sample size. However, traditional guidelines regarding this participant to variable ratio are not statistically defensible (Fabrigar, Wegener, MacCallum, & Strahan, 1999; Floyd & Widaman, 1995). Research suggests that an adequate sample size depends on the communalities of measured variables and the number of variables with substantial loadings for each factor, not necessarily on the number of variables (Guadagnoli & Velicer, 1988; MacCallum, Widaman, Zhang, & Hong, 1999; Velicer & Fava, 1998). When communalities are relatively high and factors are over-determined or represented by at least three or four variables, accurate parameter estimates can be obtained with smaller sample sizes. Based on the magnitude of communalities for individual items and the over-determination of factors in the current study, the current sample was large enough to yield valid findings. However, results should be replicated in future analysis and other samples.

Another potential limitation of the current study was the “pseudo-randomization” method employed for participants, given that entire classrooms instead of participants were randomly assigned to the intervention or control groups. Although less ideal than a proper randomization method, this “pseudo” method was employed in order to encourage

the “blindness” of teachers to the study groups, and prevent cross-contamination of social skills learned in the group within the classroom.

A final limitation is that only one post-intervention set of assessments occurred. The current results may have been strengthened by conducting further post-intervention assessments, perhaps at several months up to a year following. However, time, monetary, and geographical constraints prevented possible further analyses to be conducted.

In summary, the findings of the current study demonstrated that the First Friends preventive intervention program has the capacity to facilitate significant positive developments in children’s social skills and executive functioning. Upon completion of only a short 8-week program, the sample of kindergarten children from socioeconomically disadvantaged areas demonstrated significantly stronger socio-emotional and social cognitive abilities, more positive, prosocial behaviours, and less negative anti-social behaviours. In addition, the results of the study also demonstrated significant intervention effects on latent working memory and set-shifting or mental flexibility constructs. These results highlight the importance of not only assessing social outcomes, but also examining the development of other cognitive processes that appear to be required for learning and utilizing social and emotional skills and strategies (i.e., working memory, inhibition, and mental flexibility). Improved understanding of how different executive functions are impacted by, and impact, interventions can serve to improve and strengthen intervention strategies. The First Friends program shows promise with regard to improving both social skills and executive functioning, and continued research with and implementation of this program is warranted.

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Appendix A  
Task Instructions

**Inhibition Tasks Instructions**

**Go/No-Go: Dogs & Koala Bears Task Instructions**

The task is introduced by saying: “*Now we are going to play a game with some little dogs.*”

Part A (Dogs I)

The experimenter begins by saying, “*Here you will see little dogs that really like you to pet them. Every time you see a dog, I want you to touch them on the screen as fast as you can! When you touch the screen, you pet the little dog and he really likes that.*

*Let’s try it!*” The experimenter begins the test session. Encourage the child to respond as quickly as s/he can to each dog.

Part B (Koala Bears I)

The experimenter continues by saying, “*This part is different because now you will see dogs AND koala bears. The little dogs are tired of being pet, and they need a rest, so I don’t want you to pet them anymore. So this time I want you to pet only the KOALA bears. Every time you see a KOALA bear, I want you to touch the screen to pet him, but DON’T touch the screen when you see a little dog! Only the KOALA bears want to be pet. So, touch the screen as fast as you can when you see a KOALA, but DON’T touch the screen when you see a little dog!*” The experimenter then practices with the child by saying, “*When do you touch the screen? When do you NOT touch the screen?*” If the child seems to understand, the test proceeds. If the child does not understand, the experimenter repeats the explanation as many times as necessary and asks the child to tell what he/she is supposed to do in the game. The experimenter then begins the test session.

Part C (Dogs II)

The experimenter continues by saying, “***OK, now the KOALA bears are tired of being pet and need a rest, but the little DOGS want to be pet again. So this time, touch the screen every time you see a little DOG, but do NOT touch the screen when you see a KOALA! You don’t want to pet the koala anymore. Only pet the little DOG. So, touch the screen as fast as you can when you see a little DOG, but DON’T touch the screen when you see a koala!***” The experimenter then practices with the child by saying, “***When do you touch the screen? When do you NOT touch the screen?***” If the child seems to understand, the test proceeds. If the child does not understand, the experimenter repeats the explanation as many times as necessary and asks the child to tell what he/she is supposed to do in the game. The experimenter then begins the test session.

Part D (Koala Bears II)

The experimenter continues by saying, “***Okay, we’re almost done! This is the last part. The little DOG’s are tired of being pet and need another rest, but the KOALA bears want you to pet them again. So this time, touch the screen every time you see a KOALA, but DON’T touch the screen when you see a little DOG! So, touch the screen as fast as you can when you see a koala, but DON’T touch the screen when you see a little dog!***” The experimenter then practices with the child by saying, “***When do you touch the screen? When do you NOT touch the screen?***” If the child seems to understand, the test proceeds. If the child does not understand, the experimenter repeats the explanation as many times as necessary and asks the child to tell what he/she is supposed to do in the game. The experimenter then begins the test session.

### **Boy/Girl Stroop Instructions**

Using the Title slide, the experimenter says, “*This is a ...*[points to boy and allows child to finish sentence] *and this is a ...*[points to girl and allows child to finish sentence]. *This game is a little silly because when you see a girl I want you to say ‘boy’, and when you see a boy I want you to say ‘girl’. Try to say them as fast as you can!*” Before proceeding to the practice task ask the child: “*Can you tell me what you were supposed to do in this game?*” If the child provides the correct instructions, the experimenter then proceeds to the practice section. If the child seems to understand the practice, the experimenter proceeds with the full task. If the child does not understand, the experimenter can redo the practice as many times as necessary until the child can say in his/her own words what he/she is supposed to do in the game. During the full task, the examiner records whether the child is right or wrong after each response (self-corrected items are still counted as errors) by pressing the right or left arrow keys, respectively.

### **Working Memory Tasks Instructions**

#### **Backward Digit Span Instructions**

*Say: “We are going to play a silly game. Whatever numbers I say, I want you to say them backwards. Let me show you how to play.”*

	<b>Read (answer)</b>	<b>Correct?</b>		<b>Score</b>	<b>Read (answer)</b>	<b>Correct?</b>		<b>Score</b>
Practice	<b>3, 5</b> (5, 3)		<b>Y</b>		<b>4, 2</b> (2, 4)	N	Y	
2	<b>3, 6</b> (6, 3)	N	Y	1	<b>7, 2</b> (2, 7)	N	Y	1
3	<b>8, 1, 4</b> (4, 1, 8)	N	Y	1	<b>5, 6, 3</b> (3, 6, 5)	N	Y	1
4	<b>7, 4, 1, 9</b> (9, 1, 4, 7)	N	Y	1	<b>2, 6, 3, 5</b> (5, 3, 6, 2)	N	Y	1

#### **Backward Word Span Instructions**

*Say: “Now we are going to play another silly game. This time, whatever words I say, I want you to say them backwards. Let me show you how to play.”*

	<b>Read (answer)</b>	<b>Correct?</b>	<b>Score</b>	<b>Read (answer)</b>	<b>Correct?</b>	<b>Score</b>
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Practice	<b>Pen, cat</b> (cat, pen)		<b>Y</b>		<b>Doll, sun</b> (sun, doll)	N	Y	
2	<b>Soup, rock</b> (rock, soup)	N	Y	1	<b>Bug, cup</b> (cup, bug)	N	Y	1
3	<b>Key, dog, ear</b> (ear, dog, key)	N	Y	1	<b>Leg, moon, car</b> (car, moon, leg)	N	Y	1
4	<b>Boy, tree, hat, pig</b> (Pig, hat, tree, boy)	N	Y	1	<b>Hug, shoe, box, nap</b> (nap, box, shoe, hug)	N	Y	1

### **Jack-in-the-Box Task Instructions**

The experimenter begins by saying to the child, “*This is a friendly clown named Jack. Jack is silly because he likes to hide in boxes. I need you to find him everywhere he is hiding.*” While talking, the experimenter has the practice screen showing just two boxes. The experimenter then selects ‘Begin,’ and says, “*Let’s try one. Here are 2 boxes. Where do you think Jack is hiding?*” The experimenter has the child touch one of the two boxes. If the child guesses correctly, the experimenter says, “*Good.*” If the child guesses incorrectly, the experimenter says, “*Not there, try another box,*” and then, “*Good.*” The experimenter continues the practice session by saying, “*Now there is still one box left and Jack is hiding again. Jack can only be hiding in a different box. Can you find him again?*” When the child touches the other box, the experimenter says, “*Very good. Jack was in a DIFFERENT box. VERY GOOD JOB.*” The experimenter then asks the child to explain the rules of the game by asking, “*Can you tell me what you have to do in this game?*” If the child is unable to explain the rules correctly, the experimenter repeats the rules until the child understands. Once the child is able to verbally explain the rules him/herself, the experimenter says, “*I will tell you every time we start a new game because then you start over again looking in all the boxes. Here’s a New Game. Jack is*

*hiding in one of these boxes. Try to find him on your own.*” After each time the child finds Jack, remind the child by saying “**Now find Jack in a different box.**” If the child finds Jack but then hits the same box again, the experimenter says, “*Find him again and remember he cannot be hiding in the same box. We can look in that box when we start a new game.*” The experimenter must NOT repeat this instruction again. Each time a new game begins, the experimenter says, “*Here’s a New Game.*”

### Set-Shifting Tasks Instructions

#### Animal-Color Task Instructions

Children are shown a row of black and white and coloured animals inside of boxes and asked to name the animals. Children are told “**If you look inside each of these boxes you will see an animal. Can you tell me the names of these animals?**” The examiner corrects any errors and then moves onto the practice round. Children are told that they are going to play a naming game where they have to say either animals or colors. After this, the examiner points to the practice row and says, “**In this game, you are going to name animals or colors. For most of these boxes, you are going to do what we just did, name the animals inside of the boxes. If the box is white, you are going to name the animal, but, if the boxes have color, you are going to say the color. Let me show you what I mean.**” The examiner says the animal name or color across the practice row while pointing to each stimuli. When done say “**Now you try, name the animal or the color inside of each box.**” Correct any errors. Once the child understands the task, proceed to the test page and repeat the instructions. “**Remember, you are going to name the animals inside of the box, but if the box is coloured, you are going to say the color. Say the animals or colors as fast as you can without making mistakes. You are going**

**to go across the rows like this** [point across the rows for the child]. **Ready, go**". Record the time and errors. Self-corrections are counted as errors.

### **Color-Shape Task Instructions**

Children were first shown a practice page consisting of coloured circles and squares with cartoon faces and instructed: **"See these people? You are going to name their colors as fast as you can. Let's practice."** The children then practiced, and the examiner corrected any errors. The children then viewed a 3 row by 5 stimuli configuration of the cartoon shape people and were instructed: **"Say the colors of these people as fast as you can without making mistakes"**.

In the set-shifting condition, children were first shown a practice page and instructed: **"For most of the people, you are going to do what you just did, name their colors, BUT, if the people are wearing glasses, then you are going to name their shape. Let's practice."** The child practiced and was then shown the test page (3 row by 5 stimulus configuration, 8 without glasses and 7 with glasses). The child was instructed: **"Now you're going to do this page like you just did. Name the colors of people, BUT, if they are wearing glasses, then name their shape. Name them as quickly as you can without making mistakes."** Record time and errors.

Appendix B  
Challenging Situations Task Scenarios

1. Mary/John was building a very tall tower of blocks. But Bobby knocked it down.  
How do you feel? What do you do? Do you:
  - a. Just build another tower (prosocial)?
  - b. Hit Bobby or yell at him (aggressive)?
  - c. Cry (manipulative)?
  - d. Find something else to play with (avoidant)?
  
2. Mary/John is having a good time playing in the sandbox when Bobby hits him/her. How do you feel? What do you do? Do you:
  - a. Tell him that's not a nice thing to do (prosocial)?
  - b. Hit him back (aggressive)?
  - c. Cry (manipulative)?
  - d. Go play somewhere else (avoidant)?
  
3. Mary/John sees some of his/her friends playing a game of "Candyland." He/she would really like to play too. How do you feel? What do you do? Do you:
  - a. Ask if you can play with them (prosocial)?
  - b. Mess up the game by taking one of the pieces (aggressive)?
  - c. Stand on the side and look sad (manipulative)?
  - d. Wait and see if they notice you (avoidant)?
  
4. Mary/John was playing with a ball, but Bobby came along and grabbed the ball from him/her without asking. How do you feel? What do you do? Do you:
  - a. Ask nicely for the ball back (prosocial)?
  - b. Hit Bobby or yell at him (aggressive)?
  - c. Cry (manipulative)?
  - d. Go find something else to play with (avoidant)?

Appendix C  
Children's Coping Scales Questionnaire

Child's ID \_\_\_\_\_

**Parent's "Children's Coping Scales"**

For each of the following situations that children are likely to encounter, please rate on a 7-point scale how likely your child would be to do each of the following things. **Put the appropriate number on the space to the left of EVERY item.**

**1. When your child is hurt or angry because other children made fun of him/her, your child is likely to:**

1	2	3	4	5	6	7
not at all likely			somewhat likely			extremely likely

\_\_\_\_\_ Actively tells himself/herself that it isn't really something to get upset about or it isn't really that serious.

\_\_\_\_\_ Does something else to forget about the problem like playing a new game or playing with other children.

\_\_\_\_\_ Physically or verbally tries to hurt someone or something else because that's how he/she releases pent-up or frustrated feelings.

\_\_\_\_\_ Cries to release his/her own pent-up or frustrated feelings.

\_\_\_\_\_ Seeks the emotional support of an adult (not by crying).

\_\_\_\_\_ Stays away from the children or leaves the scene.

\_\_\_\_\_ Cries so that an adult intervenes so that he/she won't be made fun of.

\_\_\_\_\_ Does something constructive to make them stop making fun of him/her (e.g., asserts himself/herself in a positive way)

\_\_\_\_\_ Hits or yells at the children who are making fun of him/her so they will stop.

\_\_\_\_\_ Does nothing.

**2. When your child is hurt or angry because other children have started a game and will not let him/her play, your child is likely to:**

1	2	3	4	5	6	7
not at all likely			somewhat likely			extremely likely

\_\_\_ Actively tells himself/herself that it isn't really something to get upset about or it isn't really that serious.

\_\_\_ Does something else to forget about the problem like playing a new game or finding other children to play with.

\_\_\_ Physically or verbally tries to hurt someone or something else because that's how he/she releases pent-up or frustrated feelings.

\_\_\_ Cries to release his/her own pent-up or frustrated feelings.

\_\_\_ Seeks the emotional support of an adult (not by crying).

\_\_\_ Stays away from the other children or leaves the scene.

\_\_\_ Cries to get an adult to intervene so that the other children will let him/her play.

\_\_\_ Disrupts the game so that the other children can't play.

\_\_\_ Asks the other children why they won't let him play.

\_\_\_ Does nothing.

**3. When your child is angry because a peer purposely destroys something your child is making or disrupts your child during a pleasurable activity, your child is likely to:**

\_\_\_ Actively tells himself/herself that it isn't really something to get upset about.

\_\_\_ Tries to forget about it by talking to other children or doing something interesting.

\_\_\_ Physically or verbally tries to hurt someone or something else because that's how he/she releases pent-up or frustrated feelings.

\_\_\_ Cries to release his/her own pent-up or frustrated feelings.

\_\_\_ Seeks the emotional support of an adult (not by crying).

\_\_\_ Stays away from the other child.

\_\_\_ Cries so that an adult intervenes to make the peer apologize.

\_\_\_ Hits or yells at the other child so that he/she won't do it again.

\_\_\_ Tries to find out why the other child did it.

\_\_\_ Does nothing.

**4. Now we would like to get your impressions about how your child generally deals with problems. Please read each item below and indicate, by using this 7 - point scale, how likely it is that your child does the behaviour when confronted with a problem situation. Put the appropriate number on the space to the left of EVERY item.**

1	2	3	4	5	6	7
not at all likely			somewhat likely			extremely likely

\_\_\_\_ Takes some constructive action to improve a problem situation (e.g., tell others to stop teasing).

\_\_\_\_ Cries to elicit assistance from others to help solve the problem (e.g., cry so that a teacher intervenes on the child's behalf when he or she is being bullied).

\_\_\_\_ Resolves problems through physical or verbal aggression (e.g., pushes or kicks a child who has been teasing him/her).

\_\_\_\_ Avoids thinking about a problem or attempts to ignore it (e.g., fantasizes that things were different or wishes things were different).

\_\_\_\_ Leaves or avoids a problem situation (e.g., stays away from people who make him/her feel bad).

\_\_\_\_ Avoids thinking about the problem by distracting himself/herself (e.g., plays by himself or with others).

\_\_\_\_ Tells problems to friends or family in the hope of getting support.

\_\_\_\_ Cries to release pent-up feelings or to elicit comfort from others.

\_\_\_\_ Uses physical or verbal aggression to release pent-up feelings (e.g., kicking a wall after being embarrassed).

\_\_\_\_ Tries to think about the situation in a positive way (e.g., tells himself/herself everything will be o.k., tries to put the problem in perspective).

\_\_\_\_ Asks an adult or another child to help solve the problem.

\_\_\_\_ Talks with a friend or family member about the problem to help find a solution.

\_\_\_\_ Denies that there really is a problem.

Appendix D  
Observer Checklist

Child's ID: \_\_\_\_\_ Observer's Name: \_\_\_\_\_

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

<b>Negative/Anti-social Behaviours</b>	<b>Tick if observed</b>
Withdrawn (isolation/withdrawal/refusing to join group)	
Conflict-child (fighting/hitting/pushing/mean intent/stuck in a conflict)	
Conflict-adult (not obeying/physical response)	
Anger (inappropriate anger expressed)	
Disobey (refusal to obey)	
No focus (inability to focus on individual activity)	
<b>Positive/Prosocial Behaviours</b>	
Focus (positive individual/activity involvement)	
Join Group (positive group activity/involvement)	
Empathy (empathic response/caring)	
Helpful (helping children, teachers, process)	
Problem Solving (solving problems/resolving conflict verbally)	
Use Words (expression of emotions through appropriate words [even negative emotions])	
Obey (attentive to adults, instructors, interventions, redirection)	

Appendix E  
Demographic Questionnaire

This questionnaire is designed as a measure to obtain basic information about your child. We appreciate your participation in what we feel is an exciting and important study.

**ID #:** \_\_\_\_\_

**Gender:**  M  F **D.O.B.:** \_\_\_\_\_  
**Age:** \_\_\_\_\_

1. Does your child have any medical diagnoses that may impact his or her learning or behaviour?

Yes  No  Don't know

If yes, please describe: \_\_\_\_\_

2. Child's handedness

Right  Left  Ambidextrous (can write equally well with both hands)

3. Child's race/ethnicity (check all that apply)

Aboriginal/First Nation/Native American  Asian/Pacific Islander  Black  
 Hispanic  White  Other \_\_\_\_\_

4. Your relationship to the child

Biological, step, or adoptive parent  
 Foster parent. How long have you fostered this child? \_\_\_\_\_

Other, please describe: \_\_\_\_\_

5. Please indicate your highest level of education:

Grade 8 or below  
 Some high school  
 High school diploma  
 High school equivalency certificate

- Some college/university
- Trade school degree
- College (2 year) degree
- University (4 year) degree
- Some post-graduate training
- Post-graduate degree

6. If another parent is involved in your child's life, please indicate their highest level of education:

- Grade 8 or below
- Some high school
- High school diploma
- High school equivalency certificate
- Some college/university
- Trade school degree
- College (2 year) degree
- University (4 year) degree
- Some post-graduate training
- Post-graduate degree

7. Please indicate which category best matches your family's gross annual household income:

- Below \$20,000
- \$20,000-\$40,000
- \$40,000-\$60,000
- \$60,000-\$80,000
- Over \$80,000

## Appendix F

## Weekly Activities for First Friends and Control Groups

**First Friends – Weekly Activities****Week 1: Identifying Feelings****Beginning, sitting in a circle:**

**1. Begin with Hello, facilitators introduce selves, and have children say their own names in circle.** (Facilitators are sensitive to invite all children to share their name, but are careful not to make reticent children uncomfortable. Facilitators tell the group the name of any child who does not want to say it themselves, with a comment that they will talk when they are ready.) Facilitators then introduce the group’s purpose, saying it is a group to help us have fun, play together and be good friends together. Then facilitators name and describe the eight session format.

- In the introduction facilitators: (1) Mention that [we] are here to have fun, to learn to be good friends, to care for [ourselves] and others, and to play well together. (2) Mention that the way we do things in the group may be different from their classroom, but when they are in group, they listen to the facilitators and when they are in their classroom, they listen to their teacher and follow the teacher’s rules.
- Facilitators also note that the groups will begin and end each time in the circle, where we sit so that everyone is close to the centre of the circle and everyone is needed for the circle to be complete, just as is true for the groups themselves. If the children have difficulty forming a circle, facilitators can say, “Sit so that you have a neighbour on each side of you, and everyone is close.”
- Especially in the first session, facilitators are generous in listening. Facilitators follow the agenda, but do not stop children from sharing stories, even off-topic ones. Facilitators want to give the message that children are free and safe to share, especially during the circles.

**2. Doctor Game (How are you feeling?).** Facilitators ask the group if anyone knows what the “stethoscope” is as they show the children a play stethoscope. Facilitators then talk about how doctors use a stethoscope to listen to kids’ hearts, to tell if they are sick or healthy. They then say that [we] will use it to ask how [we] are feeling inside. Identify some feeling words, or, if the group seems capable, ask them what feeling words they know. Give time for answers. After doctor game, remind them, “So, if you want to know how you are feeling, listen inside yourself. Listen to your heart.”

- The leader of the first circle acts as doctor with the stethoscope, asking each child how they are feeling, one by one, around the circle. This symbolically gives the gift of undivided attention to each child at the outset of the groups, and says, “I’m here for each and all of you.” Facilitators make an effort to truly connect with each

child as they ask how they are. In subsequent groups, the children can be “doctor” for each other.

- It is a good idea to begin questions with a verbal child, and then go around the circle.

**3. Ask, “If you could be an animal, what animal would you be?”** Each child is asked to name an animal, and they are also asked why they chose that animal. Some groups understand this question with a simple introduction. Others may need some examples of a “pretend” answer. In the latter case, leaders ask another facilitator the questions so that possible answers are modeled.

- Facilitators can help the atmosphere by modeling paying attention to the leader during circle time. Facilitators help any individual children who have difficulty joining the group, staying on task, or attending.

**Middle: Each child chooses a toy animal.** Children are encouraged to draw a home for their animals, and then place their homes somewhere around the room. Then children are given time to engage in free play and encouraged to visit other animals. Transitional warnings are provided to the group near end of free play time. The transition to the ending circle is facilitated by having children clean up toys then return to the circle.

- Toys are offered by dumping the animals in a pile in the center of the circle. Children are told that there will be no turn taking, and that they are free to take the animal they like. Differences in the way the children grab toys or hold back create useful opportunities for problem solving, conflict resolution, encouraging hesitant children to join, indecisive children to exercise decision-making skills, and so on.
- Facilitators can ask or “wonder” about what the chosen animals might want or need in their homes. They can make suggestions, or listen to children’s ideas of how to care for the animals. E.g., caring can include food, shelter, family, protection, fun, friends, etc.
- Children vary widely in how long they will spend at a drawing. Some will draw quickly and then be ready for play. Others will want to spend the whole time drawing. If a child ends up alone, a facilitator can stay with them, or gently encourage them to join the group.
- Free play can be facilitated with imaginative suggestions: animals can visit other animals; empty containers can be caves; tables can be mountains.
- If animals end up “fighting”, offer the rule that toys can hit toys if both children agree, but toys or people cannot hit other people.
- Aggressive play themes are fine, as long as no one is hurt and all children stay safe.

**Ending:** Return to the circle. Facilitators review the naming of feelings; ask how the animals felt in their homes; how the children felt playing, etc. A goodbye ritual is then chosen as a group (e.g., a goodbye cheer such as “hip hip hooray”, standing up, holding hands) and at the very end facilitators hand out stickers to each child.

- During circle, children are reminded of the day's message. "If you want to know how you are feeling, listen to your heart, listen inside yourself." Facilitators tell children that it is good to know how you are feeling, because feelings can guide you and help you know about the world.
- Ending circle can include practicing showing various feeling faces: sad, happy, silly, shy, etc. as a game, as a group, or with individuals.
- Be sure that each facilitator makes some connection with each child, sometime during the first session, so each child knows the facilitators (adults) in the room see them and are available to them.

## **Week 2: Empathy**

### **Beginning:**

**1. Begin with Hello, How are you feeling? Have children play doctor game** - this time the children are doctors for their neighbours. Facilitators then mime feeling faces for the group, and/or have them show happy, sad, silly, scared, angry faces.

- As an introduction to the shared doctor game, children are told, "If you want to know how you are feeling, listen to your heart. If you want to know how someone else is feeling, look at their face, or ask them." Facilitators model this in comments and gestures during the doctor game.
- Some children may be hesitant to participate. Be sure a facilitator asks every child how they are, with stethoscope, even if child doesn't want to "be" doctor.
- Sometimes at this point, discussions emerge concerning times or situations that are connected with certain emotions. Encourage this sort of sharing, and address any emotionally potent moments.

**2. Ask – If your Mom were an animal what animal would she be?**

- Pay therapeutic attention to the messages children give about their mothers.
- Be aware that sometimes children don't have a "mother." This can be gently discussed, normalized, and the imaginal game modified for that child to consider whoever their primary caregiver is.

**3. Read Book (Lots of feelings by Shelley Rotner) showing Feeling Faces**

- The book is read slowly, encouraging children to stay with pictures. Facilitators help redirect children whose attention wanders.
- Facilitators allow time for discussion. If one child dominates verbally to the point that all others lose interest, offer to listen to the speaking child during free time, and continue with reading.

**Middle: Have children draw an ocean on one piece of large white butcher paper.**  
After the drawing, each child can choose a sea animal, and find them a home in the ocean.

Children are encouraged to visit and find out about the other animals. Again provide transitional warnings and transition to ending circle by having children help put away toys.

- This activity involves children each contributing to one big drawing, so potential conflicts regarding ownership/sharing of drawing space can provide opportunity for practicing problem solving.
- Toy sea animals are offered only after all children have contributed to the drawing of the ocean. Emphasize that each child's drawing helped to make the one ocean.
- A discussion of what the sea animals might need, what types of things are in an ocean, etc., is useful in generating ideas and interaction.
- Honouring the picture that was drawn is important. At some point during the activity, facilitators have children stand around drawing and admire the work they've done together.

**Ending:** Facilitators check in with children in the group. Then invite children to guess facilitators own or other children's feeling faces. Facilitators review the day's message, "If you want to know how someone else is feeling, look at their face, or ask them." Group ends with the chosen goodbye cheer and stickers.

### **Week 3: Assertiveness**

#### **Beginning:**

#### **1. Hello, how are you? Doctor Game.**

- Review the previous week's messages and play the doctor game, with either the facilitators or the children playing doctor for the other children in the group. Make sure each child is asked how they are, to continue the practice of sharing attention and identifying emotions.
- Have creative variations on the doctor game. Facilitators can also guide comments toward greater complexity of self-reflection. (E.g., "You're feeling sad today. Thanks for letting us know. I wonder if something has happened that makes you sad." Or, "Sometimes just telling someone else how you are feeling, can help you start feeling better.")

#### **2. Read Nimby by Jasper Tomkins.**

- Children love to guess the shapes that Nimby becomes, page by page.
- After leader finishes reading story, they discuss how Nimby had different ideas from the others. Leader also states how Nimby tried playing with some clouds, it didn't work, and then he found a playmate (the island) that was great fun.
- Facilitators segue into a discussion of how sometimes friends say yes when you ask to play with them, and sometimes they say no (because they have a different idea for what they want to do). Discuss with children how someone is still a friend even though they may not want to play with you sometimes. Reverse the roles, and

mention that “you too may not want to play what your friend suggests, but you still feel friendly toward them. You are still friends.”

- Have children share examples.

**3. Teach poem, “Say yes, Say no, say what’s on your mind; say it with a voice that is strong and kind.” Give kids the challenge to say yes or no later during free play.**

- Facilitators say the poem, explaining each phrase. (“Say yes, say no. It’s okay to say yes sometimes and no sometimes to friends’ ideas. Say what’s on your mind. Go ahead and say what you want and how you feel. But use a voice that is strong and kind. Talk with strength, and with kindness.”) Then facilitators say the poem again as a continuous poem. Then, facilitators have the group say the poem, line by line.

**Middle: Make homes from blocks, cars, roads drawn on butcher paper for visiting.**

- Children first build a home with the small blocks, somewhere on the periphery of the butcher paper.
- After a child has built a home, facilitators have them identify who they want to visit, and have them ask the other child whether they can visit. Remind children that they can say yes, no, not now, etc.
- Facilitators use black markers to draw roads from house to house.
- Children finished with a block house and an idea for a visit may then pick a car and a person figure.
- Facilitators try to catch interactions to emphasize chances for assertiveness and praise all efforts/successes.

**Ending: Facilitators review the poem/message “Say yes, say no...” . The group ends with a goodbye cheer and stickers.**

- Sometimes there is a need to “debrief”, when a child is hurt when told “no” by a friend to a visit request. Facilitators can give both sympathy for hurt feelings and reminders that when someone says “no” to play, they can still be a friend.
- If a child says negative things about another child in the group, so that the other child feels hurt, have a facilitator intervene with the child to discuss kindness, empathy, appropriate comments.

**Week 4: Anger Management**

**Beginning Circle:**

- 1. Begin with Hello, how are you, doctor game.**
- 2. Anger talk, blow out candles, belly breathing.**

- In the circle, facilitators ask whether anyone has ever felt angry. They then listen to the children's answers and address any significant stories that emerge.
- Facilitators then discuss what anger looks like on the face and feels like in the body (racing heart, hot face, clenched fists and face...). They then discuss how it is hard to make good decisions when angry, and how it is a good idea to slow yourself down so you can think clearly.
- Facilitators demonstrate and then practice several times with the children slow belly breathing (like blowing up a balloon in your belly) and blowing out pretend candles on fingers with a slow steady breath. Children are told that when they breathe slowly, they become calm and it is hard to be angry then.

### **3. Practice “Stop, breathe, and proceed when safe” with sports motions.**

- Here, children are taught steps for anger management and emotional regulation through the use of easy hand motions to aid in retention. Each motion reminds child of steps to control strong emotions.
- Facilitators model for the children the stop (hand stretched out in front of you), think (finger to temple), breathe (arms crossed across chest and show breaths), and go ahead (rolling pin arms, like a traveling ref call), when safe (arms out to side, like baseball safe ref call).
- Children then practice becoming “racy” or “angry” by running in place, then clenching arms and face, then do the anger dance with motions and slow breathing.

### **Middle Free Play: Dinosaurs and blocks. Offer little direction. Model “wild” dinosaur feeling.**

- This session is designed to provide for much free time and open-ended play with the dinosaur toys, with the thought that if any “anger” themes need to be played out, after discussing anger management, this will provide the best opportunity.
- Facilitators provide relatively little guidance. Children each select a dinosaur(s).
- If the children do not seem to know what to do with the blocks, facilitators can offer some ideas – food, caves, homes, land, etc.
- Any time a child or dinosaur seems to be getting upset, they and the whole group are reminded about stop-think-breathe-and go ahead when safe motions to help calm down.

**Ending Circle: The message for the group is reviewed, and children again practice the “Stop, breathe and go ahead when safe” motions. The group ends with a goodbye cheer and stickers.**

## **Week 5: Conflict Resolution**

### **Beginning Circle:**

#### **1. Begin with Hello, how are you, Doctor Game**

## 2. Facilitator reads Mr. Gumpy's Outing by John Burningham

- Facilitators let the children participate in the reading by making the sounds of each animal.

## 3. Discuss 5 steps of problem solving/conflict resolution: 1) What is the problem (both sides)? 2) What are some plans? 3) Pick a plan. 4) Do the plan. 5) How did it work?

- Facilitators use Mr. Gumpy as example of a problem. "Mr. Gumpy had a problem. He had one small boat and everyone wanted a ride in it." Have children identify what some plans might have been (take turns in boat, take only a few, say no to any rides...). Then discuss what he did choose, how it turned out, and what he might try the next time.
- If a child has an example of a problem from school or home, take the time to discuss it in terms of problem solving.

### **Middle Play Session: Make fish for pond. Fish in pond.**

- Facilitators first let children choose and decorate fish shapes with markers at a table.
- Once children have a fish drawn, facilitators slide a paper clip onto their fish and toss it in a circle of yarn placed on the floor ("the lake"). Each child is given a rod with a magnet tied onto the end ("fishing pole"). If needed, children are shown how to fish for their own or other fish. Facilitators scatter several fish with clips into the fishing area for all to catch.
- Discuss with children that catch and release will help the game carry on.
- The poles get tangled easily, which offers many opportunities for facilitators to intervene and help children to problem solve.
- Some children feel strongly about wanting to find their own fish and not have others fish for "their" fish. Facilitators can use these moments as a problem solving scenario, deemphasizing there being a right or wrong way.

### **Ending: Review 5 step problem solving. End group with goodbye cheer and stickers.**

## Week 6: Caring/Nurturing

### **Beginning Circle:**

#### 1. Hello, check in and Doctor Game

- Because Caring is the day's theme, leaders emphasize empathic concern as the check in or Dr. Game unfolds.

## 2. Read *The very quiet cricket* by Eric Carle

- Children are encouraged to participate during the story. After the story, facilitators discuss how the cricket was cared for by all the other animals until he was ready to sing.

## 3. Discuss *Caring for self, Caring for others*

- Facilitators discuss how good it feels to be cared for, to take good care of yourself, to win, to get what you want. They then tell the children that it also feels good to care for others, to let others win, and to help others get what they want.
- Facilitators allow time for any discussion regarding what children want and how they feel when losses happen, etc. Acknowledge that not getting what you want can sometimes not feel good. “Sometimes we get what we want, and sometimes we don’t. Sometimes we win, and sometimes we don’t. We all have our turn for both.”

### **Middle Activity: Insects and nests (nests or homes made from crumpled newsprint)**

- Leader show children how a piece of newspaper can be crumpled to make a nest or a cave. Creativity is encouraged. Children can use markers to add details to their nests (e.g., food, bed, etc).
- The children choose an insect from the outset this time, so that they have an object they are “caring for” from the beginning of the activity.
- Children are then provided ample opportunity for free play, letting the children interact, with facilitators reminding them about the various tools they’ve learned as they are needed.

**Ending Circle:** Review idea that it is good to care for yourself and good to care for others. Review how the children took good care of their insects and of each other. Children take their nests home. End with goodbye cheer and stickers.

## **Week 7: Planning/Decision Making**

### **Beginning Circle:**

#### **1. Hello, how are you, check in and Doctor Game**

- Facilitators review with children all of the messages from earlier sessions.
- Children are told that the next session will be the last one. Children are then given a chance to discuss any feelings they may have.

#### **2. Make a moving machine**

- Facilitators first model, then have the children one by one begin a small, repetitive movement, and then have each subsequent child join in with their own, connecting movement, until all are part of a large “machine” with separate parts.

**Middle Play Activity: City/People/Roads. “Build a city together.”**

- Before moving to the play area, facilitators have the children discuss what there is in a city. Each child then chooses what they will make to help build a city together.
- Facilitators place piles of blocks around the edge of taped down butcher paper to let children begin to build parts of a city. Markers for roads or for drawing are also available.
- Each child then chooses a person after having helped create the city.

**Ending Circle: Pick activity for last meeting (Decision making). Goodbye/stickers**

- Facilitators remind the children of the various activities done during the seven weeks, and let them know they can vote for which activities (more than one is fine) to play together on the final day. They can vote activity by activity, and can vote more than once.
- Facilitators incorporate a review of problem solving/decision making along with the process of picking.
- Some groups focus on a few activities, while others have children voting for each. As a rule, each child should have something that they voted for.
- Facilitators again mention that the next session will be the last, so there will be a big goodbye.

**Week 8: Self-Esteem and Review**

**Beginning Circle:**

**1. Hello, how are you feeling on the last week? Check in and Doctor Game**

- Facilitators acknowledge that goodbye can be happy and sad. “I am glad we’ve had this time together, and I will miss you and think of you all when we are not meeting.”

**2. Gift wrapping each child.**

- Facilitators introduce the gift wrap game by showing children the rolls of toilet paper, and telling them that they will be playing with something that they should never play with at home.
- Facilitators have the children stand in a circle. One by one each child stands in the centre. Leader or facilitator will wind toilet paper around the child’s trunk (shoulders to hips), encouraging the others to count the wraps (use number of

children in group as the number of wraps). When wrapping is complete, break off and tuck in the end, then invite the wrapped up child to break free, as everyone cheers and claps and says, "Hooray for the gift of (child's name)."

- Facilitators acknowledge the children who have to wait for their turn.

**Middle Play Activity: Activity chosen at last meeting.**

- Facilitators review all messages of previous groups: feelings, empathy, assertiveness, anger management, conflict resolution, planning, caring, and self-esteem.
- This day can be quite chaotic, as there are multiple activities going on. Facilitators help the children self-regulate by reminding them of the various tools introduced in the groups (checking feelings, awareness of others, caring, anger management, problem solving, planning)

**Ending Circle: Children are provided with a final token gift and goodbye.**

- Facilitators let the children know that they have learned more about being good friends, about taking care of themselves and each other.
- Facilitators say an honouring goodbye.
- Every child encouraged to state feelings about it being last group and feelings are responded to in a caring and empathic manner by facilitators.
- Children are encouraged to continue practicing skills.
- Facilitators give a small gift to each child symbolic of their time together and of the group's concepts.
- Facilitators then say goodbye to each child by name as the group ends.

### Control Group: Weekly Activities

**Week 1:** Butterflies - Two short books on butterflies were read and discussed (**Caterpillar, caterpillar by Vivian French; illustrated by Charlotte Voake, and Butterfly, butterfly by Petr Horáček**). Children were then instructed in how to create their own butterflies (using coffee filters, pipe cleaners, and water-based markers). The group finished with each child selecting a butterfly sticker.

**Week 2:** Birds – A book on birds (**Our yard is full of birds by Anne Rockwell, illustrated by Lizzy Rockwell**) was read and discussed. The children were then instructed on how to make their own birds (using a toilet paper roll, bird template cut-outs [containing wings, head, tail, and feet], glue, scissors, water-based markers, and any other craft supplies they chose (i.e., glitter, stamps, etc.)). The group finished with each child selecting a bird sticker.

**Week 3:** Bugs – Two books on bugs (**Are you a ladybug? by Judy Allen, illustrated by Tudor Humphries, and Bugs up close, written by Diane Swanson and photographed by Paul Davidson**) were read and discussed. The children were then instructed on how to make their own bugs (using small paper plates, paper, and/or other materials provided and a variety of different possible decorations – eyes, markers, glitter, stickers, etc.). The group finished with each child selecting a bug sticker.

**Week 4:** Caterpillar – Two books on caterpillars were read (“The very hungry caterpillar” by Eric Carle and “**The caterpillar's story**” by **Achim Bröger with**

**pictures by Katrin Brandt).** Then children were provided with a picture of a “hungry” caterpillar and instructed to draw what the caterpillar ate on the different parts of its body. The group finished with each child selecting a bug sticker.

**Week 5:** Constellations – Two books on stars/constellations were read (**Constellations : a glow-in-the-dark guide to the night sky by Chris Sasaki, illustrated by Alan Flinn, and Our stars, written and illustrated by Anne Rockwell**). Then children were instructed to make their own constellations using construction paper and star stickers. The group finished with each child selecting a star sticker.

**Week 6:** Dinosaurs – Two books on dinosaurs were read and discussed (**Dinosaurs: What did dinosaurs eat? : and other things you want to know about dinosaurs , written by Elizabeth MacLeod , illustrated by Gordon Sauv , and How do dinosaurs say I love you? by Jane Yolen , illustrated by Mark Teague**). Then, children were instructed on how to make their own dinosaurs by selecting a dinosaur template (either triceratops or diplodocus), and using a toilet paper roll, glue, markers, and other craft items to create their own dinosaurs. The group finished with children selecting a dinosaur sticker.

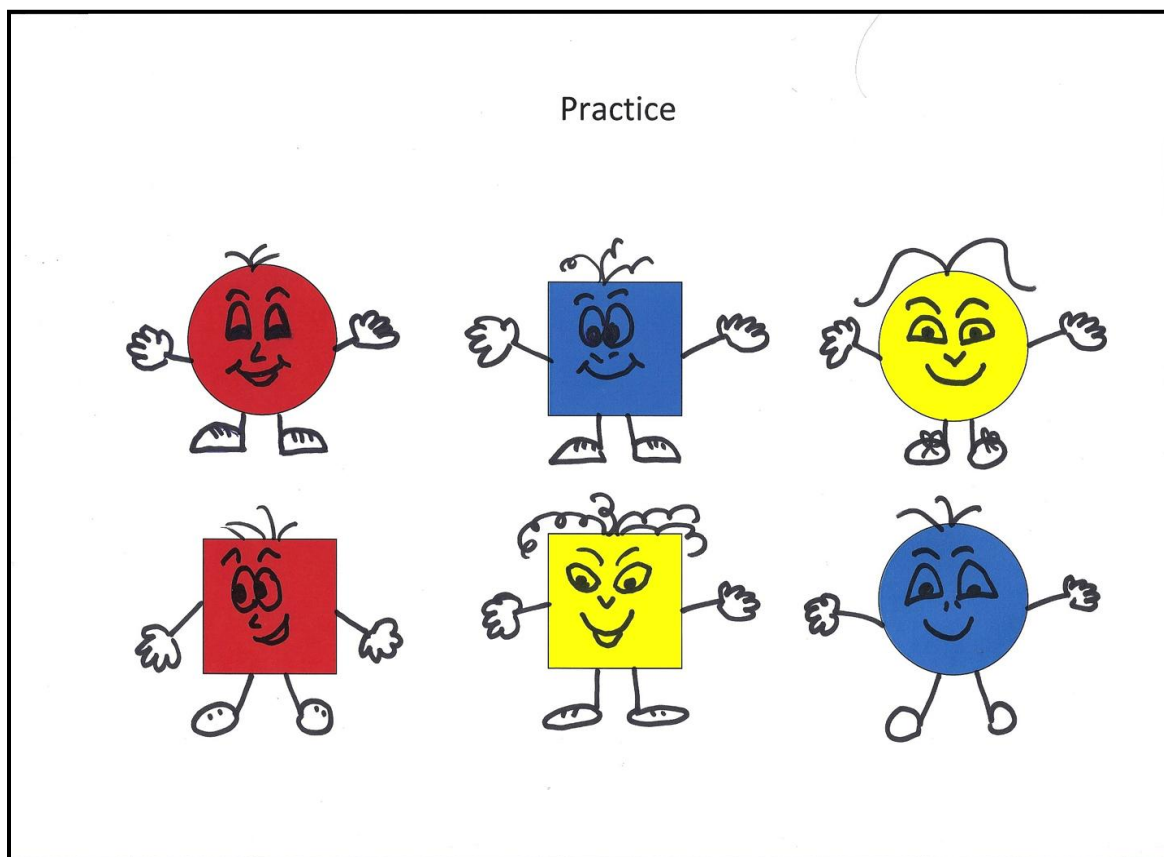
**Week 7:** Fish – Two books on fish were read and discussed (**Fish: Please don't eat me, by Roger De Muth, and Fish by Tracey Crawford**). Children were told that the following group would be the last group and given an opportunity to discuss this as a group. Children were then instructed to color/create their own fish

using the paper plate template and craft items provided (i.e., googly eyes, jewels, glue, markers, stamps, etc.). The group finished with children selecting a fish sticker.

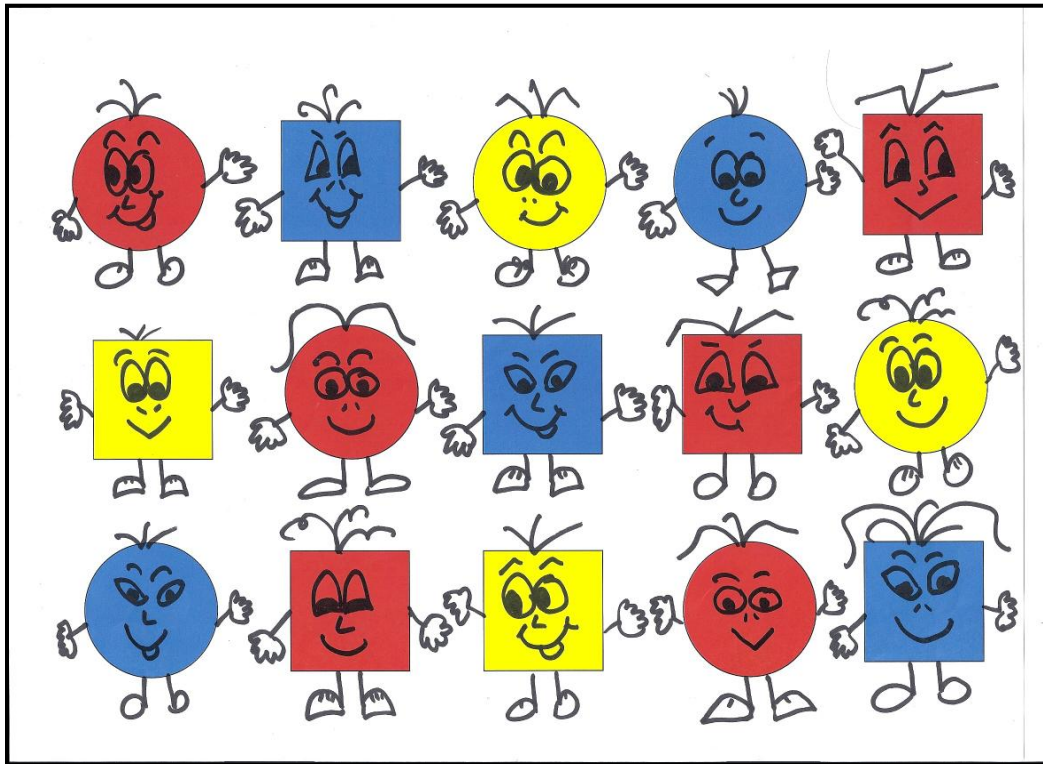
**Week 8: Frogs** – Two books on frogs were read and discussed (A froggy fable by John Lechner, and Bee frog by Martin Waddell, illustrated by Barbara Firth). Children were told this was the last group and provided an opportunity to discuss their feelings/debrief about this. Children were then instructed on how to create their own frogs using the construction paper template provided and any craft items they chose (i.e., googly eyes, markers, jewels, glue, stamps, paper, etc.). The group finished with children selecting frog stickers and receiving a gift of small toys chosen to represent the different topics learned over the 8 weeks.

Appendix G  
Color/Shape Task Stimuli

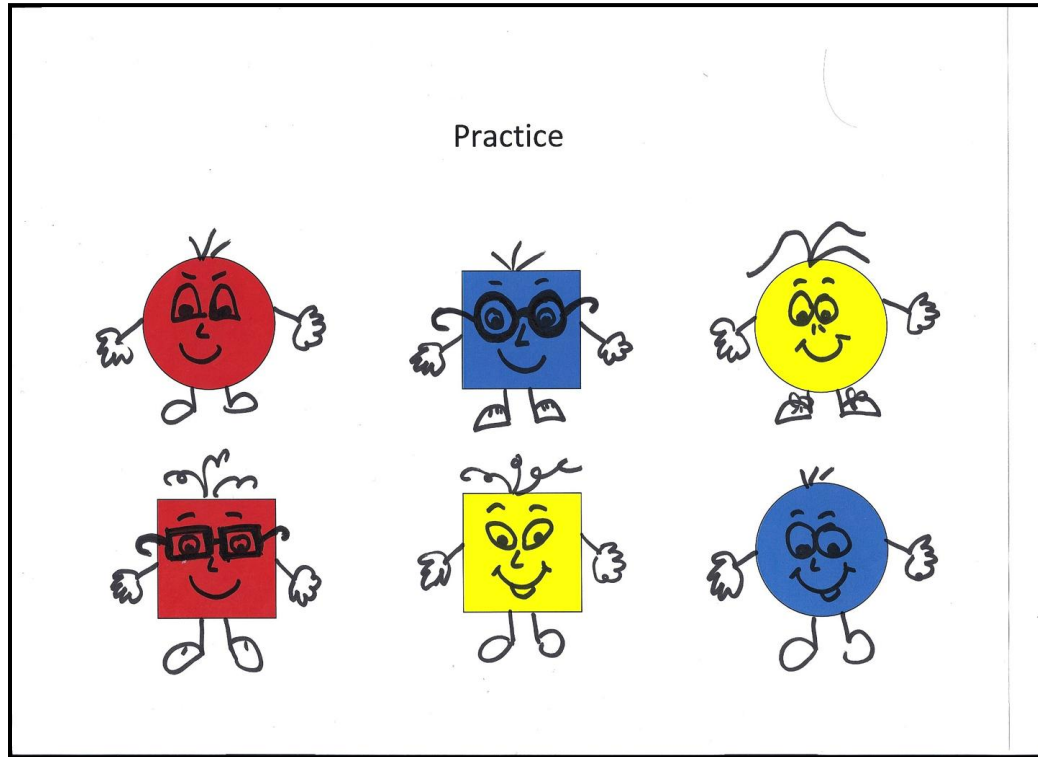
Color/Shape Stimuli: Baseline Practice



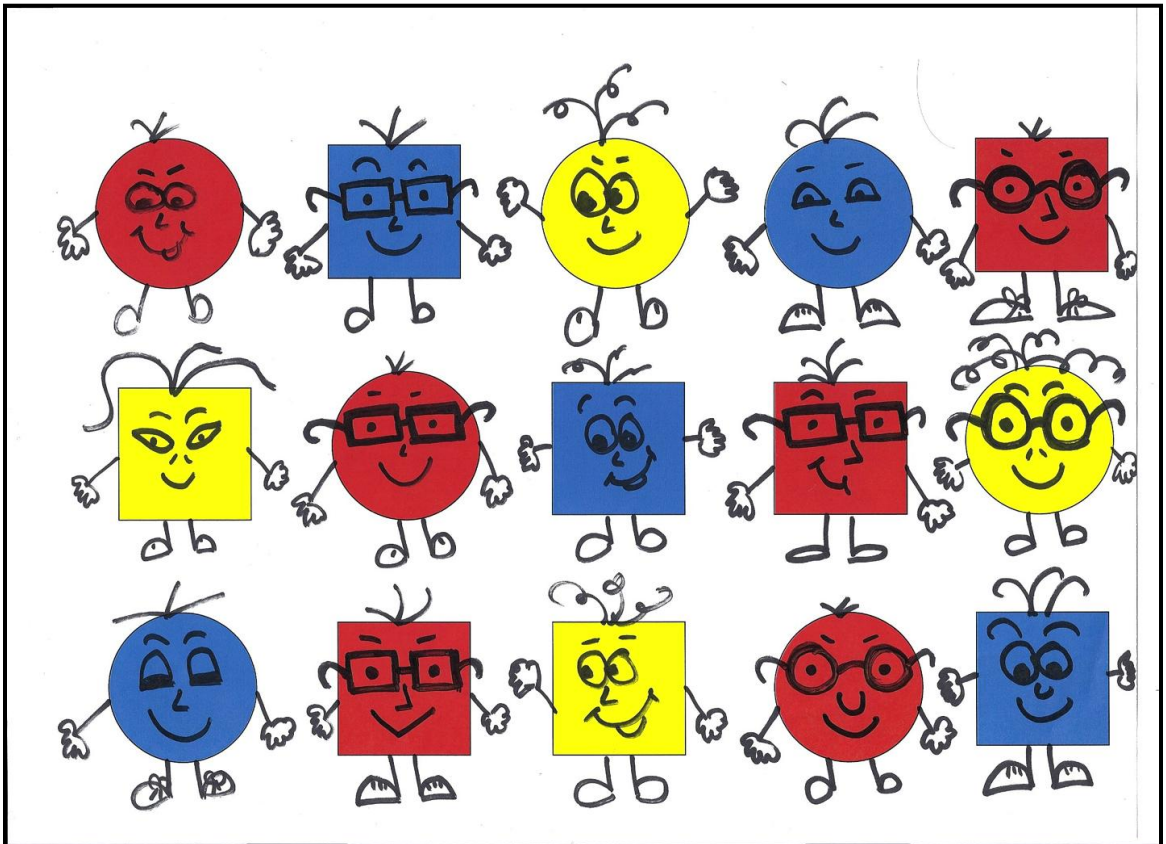
Color/Shape Stimuli: Baseline



Color/Shape Stimuli: Set-Shifting Practice



Color/Shape Stimuli: Set-Shifting



Appendix H  
Animal-Color Task Stimuli

# Practice



## Animal/Color Task Stimuli

Correct Responses

Red Cat Blue Sheep Yellow  
 Bear Blue Cat Yellow Red  
 Cat Bear Yellow Blue Sheep  
 Yellow Cat Blue Bear Red