2017

Investigating the Effects of Mindfulness on Children's Executive Function, Emotional Regulation, Stress, and Academic Performance Compared to a Control Condition

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INVESTIGATING THE EFFECTS OF MINDFULNESS ON CHILDREN'S EXECUTIVE FUNCTION, EMOTIONAL REGULATION, STRESS, AND ACADEMIC PERFORMANCE COMPARED TO A CONTROL CONDITION

By

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Bachelor of Arts, Honours Psychology

York University, 2015

THESIS

Submitted to the Department of Psychology

in partial fulfillment of the requirements for

the Master of Arts in Psychology

Wilfrid Laurier University

Abstract

Mindfulness is a growing field in the study of psychological well-being, with reports of individuals experiencing increases in resilience and reduced stress. The current research on mindfulness lacks information on a comprehensive analysis on the relationship between mindfulness and executive function, emotional regulation, stress, and subsequent academic performance for children. Additionally, studies contain methodological issues, such as the absence of active control groups. Hence, the current study assessed the effects of mindfulness training on children's executive function, emotional regulation, stress, and academic outcomes compared to an active control group. There were 51 younger children from grades 2 to 4 (Mean Age = 8.51, *SD* = .731) and 47 older children from grades 7 to 8 (Mean Age = 12.68, *SD* = .471) who participated in the present study. Children were randomly assigned to an eight-week Mindful Me! or Social Skills program, the active control group. Children completed pre- and post-test measures, which assessed mindful attention, emotional regulation, and executive function. Blood pressure and heart rate data were collected before and after sessions to reveal physiological stress outcomes. To assess academic performance, children completed journals.

Results indicated limited support in response to the Mindful Me! program across a range of outcomes for children at different developmental stages. The findings suggest that mindfulness can galvanize executive function skills in children in the areas of working memory and cognitive flexibility. The younger children from the Mindful Me! condition significantly increased their working memory scores from pre- to post-test in the forward portion of the task with higher effect sizes revealed for length of sequence recalled (d = .55) and total number of trials correct (d = .54). In contrast, the younger children from the active control condition had lower effect sizes for length of sequence recalled (d = .25) and for total trials correct (d = .19).

Further, younger children from the Mindful Me! condition significantly increased their scores in cognitive flexibility from pre- to post-test with a higher effect size (d = .61) reported relative to younger children from the active control condition (d = .08). The results also revealed improved emotional regulation skills through significantly decreased levels of rumination from pre- to post-test for older children from the Mindful Me! condition, with a higher effect size (d = .42) reported relative to older children from the active control condition (d = .28). Older children from the Mindful Me! program further reported significant decreases on the forward portion of the working memory task and for inhibition, which was not consistent with previous literature. Finally, there were no conclusive evidence for stress and academic outcomes. The results suggest that the mindfulness has potential positive impacts on some aspects of executive function and emotional regulation for children at specific developmental periods. Further research should examine mindfulness in children within a developmental framework that recognizes that personalities, competencies, and behaviours emerge and change across childhood and early adolescence.

Keywords: mindfulness, children, executive function, emotional regulation, stress, academic performance, control condition

Acknowledgements

I owe my deepest gratitude to a number of people who were involved in the completion of this thesis project. First, I would like to thank my supervisor, Dr. Kim Roberts, for providing her utmost guidance and positive encouragement throughout the past two years. Your supervision has inspired me not to underestimate my abilities even in the most challenging circumstances. I would also like to thank my two committee members, Dr. Tobias Krettenauer and Dr. Nancy Kocovski, for taking the time to provide feedback and suggestions on my paper.

I owe special thanks to my colleagues, Vivian and Kathy, who were always open to providing their insights and were always available to answer any questions that I had. Also, to the research assistants, who were involved in all of the data prep, data collection, and data analysis. Without their time and commitment, this project would not have been possible. I owe thanks to the three schools from the Waterloo Region District School Board who participated in this project and allowed me to explore this topic.

I have also met great friends along the way, Alexandra Bellissimo, Bahar Amani, and Katie Tamming, who started this journey with me and were there by my side the entire way. Finally, I would like to show deep gratitude to my family and friends. My parents and my sisters, Linda and Natali, who were always there to listen, who always cared, and always showed me the clear path in times when I needed it the most.

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Investigating the Effects of Mindfulness on Children's Executive Function, Emotional Regulation, Stress, and Academic Performance Compared to a Control Condition

International reports reveal that at least 20% of young individuals develop one mental health problem before 18 years of age, and the onset of a major mental illness may occur as early as 7 to 11 years of age (Kessler et al. 2005; de Carvalho, Pinto, & Maroco, 2016). In Canada, it is estimated that 10-20% of youth are affected by a mental health problem and only one out of five children who need mental health services receives them (Canadian Mental Health Association, 2016). Mental health problems in children are associated with social and academic disruptions in classrooms, and as a result, there has been an increased need to implement school-based prevention programs to promote protective factors and foster resiliency (Schonert-Reichl & Lawlor, 2010). Schools can be a crucial setting for the development of social and emotional skills along with academic competencies, since children spend many hours in school (de Carvalho et al., 2016). Prior evidence has shown that school-based programs are important for decreasing children's anxiety, behavioural problems, and attention issues (e.g. Semple, Lee, Rosa, & Miller, 2010). Furthermore, school-based programs can enhance coping abilities in children and adolescents, which can help them to tackle stressful situations, such as tests, and support the development of their full potential (National Research Council and Institute of Medicine of the National Academies, 2009; Masten & Motti-Stefanidi, 2009; Bennett & Dorjee, 2016).

Preliminary evaluation suggests that school-based mindfulness programs have the potential to be effective tools for mental health promotion for children. Mindfulness programs have previously been implemented in schools where children have subsequently reported gains in social, cognitive, behavioural, and emotional regulatory skills (e.g. DeUrquiza, 2014; Black &

Fernando, 2014; van de Weijer, Langenberg, Brandsma, Oort, & Bögels, 2014; Viafora, Mathiesen, & Unsworth, 2015; Parker, Kupersmidt, Mathis, Scull, & Sims, 2014). Furthermore, mindfulness has been associated with improved self-regulation, attention, and reduced stress, which makes it a significant contributor to school readiness and academic success (Black & Fernando, 2014; Willis & Dinehart, 2014; Ponitz, Rimm-Kaufman, Grimm, & Curby, 2009).

Mindfulness has been considered from a developmental framework. For example, previous studies have demonstrated the benefits of mindfulness on mental health and well-being for elementary and middle-school aged children (e.g. Napoli et al., 2005; Wall 2005; Semple et al., 2009; Flook et al., 2010; Schonert-Reichl & Lawlor, 2010) and for high school aged adolescents (e.g. Bootzin & Stevens, 20015; Beauchmin et al., 2008; Zwlowska et al., 2008; Bogels et al., 2008; Biegel et al., 2009; Broderick & Metz, 2009). Researchers have contemplated assessing mindfulness across developmental stages, but to date there has been no thorough exploration in the literature. Children's personalities, behaviors, and competencies form and persist into adolescence and adulthood, but it is not known whether mindfulness can affect children differently depending on their stage of development (Collins, 1984). Previous literature has considered mindfulness-based interventions as an approach to teach children about their changing natures (Roeser & Pinela, 2014; Schonert-Reichl et al., 2015). The current study will add to the array of literature that considers mindfulness from a developmental framework by assessing whether mindfulness affects children differently depending on age. The present study recruited younger children (age 7 to 10) and older early adolescent children (ages 12 to 13) to assess age group differences as a result of mindfulness. This exploratory analysis will provide evidence as to whether mindfulness affects children across varying developmental stages.

Defining Mindfulness

Mindfulness has been in existence for approximately 2,500 years and has only recently attracted scientific research (Salustri, 2009). Mindfulness' roots stem from Buddhism. The Dalai Lama advised researchers and professionals to find ways to make mindfulness practices more accessible in secular contexts (Davidson, Houshmand, & Kabat-Zinn, 2011). Mindfulness training has since been applied to a variety of individuals regardless of religious affiliation, scientific beliefs, ethnicity or cultural background, and has been designed not to conflict with anyone's beliefs or traditions (Salustri, 2009).

Mindfulness as a popular movement was bolstered by Jon Kabat-Zinn and his colleagues (1990) from the University of Massachusetts Medical Center. The Medical Center offers a stress reduction program, Mindfulness-Based Stress Reduction (MBSR), which uses meditation and yoga for patients with medical and psychiatric diagnoses. Attention and awareness are consistent characteristics of mindfulness. *Attention* involves continually monitoring the inner and outer environment and *awareness* involves involves being cognizant to sensory experiences, such as becoming aware of smell and touch (Brown & Ryan, 2003).

Kabat-Zinn (2003) operationally defined mindfulness as the awareness that emerges from paying attention to the present moment non-judgementally. Additionally, Bishop et al. (2004) proposed that mindfulness involves the self-regulation of attention and acceptance of one's experiences in the present moment. Being mindful requires focus on current experiences rather than being on "automatic pilot" or compulsive and automatic, which involves engaging in behavior that is out of awareness and attention (Schonert-Reichl & Lawlor, 2010). Therefore, when something arises, there is acceptance and non-judgement at that moment, which allows for clarity and attention (Meiklejohn et al., 2012).

There are a number of mindfulness-based programs already being practiced by students in a number of schools. These programs have been influenced by the well-established MBSR program (Kabat-Zinn, 1990), which was developed for adult populations and has strong support through research evidence (Chiesa & Serretti 2009; Hofmann, Sawyer, Witt, & Oh, 2010; Khoury et al. 2013; Bennett & Dorjee, 2016). However, there are concerns about the length (2.5 hours) and the language of standard MBSR programs when these programs are implemented for children, as they may not be developmentally appropriate. There are now a plethora of mindfulness-based programs suited for students in schools, which are shorter than the standard MBSR and more feasible in the school system (Bennett & Dorjee, 2016). The current mindfulness-based programs that are being used in schools include Learning to BREATHE, Mind Up Curriculum, and Mindful Schools (Meiklejohn et al., 2012). Evidence shows that both standard and adapted versions of MBSR for children and adolescents can encourage improvements in well-being and in academic performance when implemented for children who suffer from psychological and academic deficiencies (Biegel, Brown, Shapiro, & Schubert, 2009; Semple et al., 2010; Wall, 2005).

Developmental Nature of Mindfulness

Mindfulness-based approaches designed for children and adolescents is expanding, with evidence supporting that the approaches are both acceptable and feasible for youth (Meiklejohn et al., 2012). While studies report the many benefits of mindfulness on children's mental health, the literature remains limited. Meiklejohn et al. (2012) wrote a review outlining mindfulness-based programs for children and adolescents in both school and clinical settings. The studies they reviewed included secular mindfulness-based programs and the most commonly used interventions that were used are based from MBSR and Mindfulness-Based Cognitive Therapy

(MBCT) programs. The review outlined the positive benefits of mindfulness for elementary- and middle-school-aged children, such as reduced test anxiety and increased teacher rated attention and social skills (Napoli et al., 2005), enhanced well-being and relaxation (Wall 2005), reductions in behavioural and anger management problems reported by parents (Semple et al., 2009), improved overall executive function, such as attention shifting, monitoring, and initiating (Flook et al., 2010), and increased optimism and increased teacher rated behaviour and social competence (Schonert-Reichl & Lawlor, 2010). Meiklejohn et al. (2012) further reported the positive benefits of mindfulness for high-school-aged adolescents. They reported positive benefits for sleep and reductions in worry and mental distress (Bootzin & Stevens, 20015), improvements in teacher rated social skills, problem behaviours and academics, (Beauchmin et al., 2008), improvements in self-reported ADHD symptoms, anxiety, depressive symptoms, and working memory (Zwlowska et al., 2008), improvements in self- and parent-reported measures of sustained attention, personal goals, subjective happiness, and mindful awareness (Bogels et al., 2008; Biegel et al., 2009), and reductions in tiredness, aches, and pains (Broderick & Metz, 2009).

The review by Meiklejohn et al. (2012) recognized the positive benefits of mindfulness on children and adolescents' mental health and well-being. On the other hand, the review was also aware of the limitations that the studies contained. For example, they recognized that the current research includes a number of methodological limitations, including small sample sizes, pilot studies, uncontrolled, and wait-list conditions. Meiklejohn et al. (2012) emphasizes that there needs to be ongoing research in order to broaden the credibility and application of mindfulness training for children and adolescents. In view of these limitations, the present study will add to the array of theoretically based evaluations of mindfulness programs by examining the effectiveness of a mindfulness-based program for children in comparison to an active control condition.

For the current study, participants from grades 2 to 4 and grades 7 to 8 were used to collect data regarding the effects of mindfulness on executive function, emotional regulation, stress, and academic outcomes. Research suggests that there may be developmental barriers that may prevent younger children from acquiring the benefits of mindfulness seen in older children. For instance, late childhood and upper elementary school children's (grades 4 to 5) personalities, behaviors, and competencies form and persist into adolescence and adulthood (Collins, 1984). Additionally, before puberty, children are undergoing substantial changes in their prefrontal cortex, which sets the foundation for advances in executive function in later childhood and adolescence (Giedd, 2008). The mental changes that are apparent leading up to puberty are associated with significant changes in self-regulatory and self-reflective abilities (Zelazo & Carlson, 2012), and the abstract nature of self-representations that comprise the self-system (Harter, 2006; Roeser & Pinela, 2014; Schonert-Reichl et al., 2015). During these years, children become less egocentric, where they consider other people's perspectives and feelings and act prosocially in accord with their higher levels of self-understanding (Eisenberg, Fabes, & Spinrad, 2006). Providing programs that support the development of self-regulation and reflection could decrease or prevent mental health and school-linked issues that arise when children transition into secondary school and puberty (Eccles & Roeser, 2009). Mindfulness-based interventions might be considered as an approach to teach young children about their changing bodies and minds by making them more aware and compassionate towards their changing natures (Roeser & Pinela, 2014; Schonert-Reichl et al., 2015). However, it is not yet understood the specific developmental nature of mindfulness between younger children and early adolescent children.

Additionally, it is not known whether younger children truly absorb the theories underlying mindfulness, as the concept may seem too abstract for their developmental level. Thus, the current study will be exploratory in regard to understanding the developmental difference between younger and early adolescent children and whether mindfulness should be considered from a developmental framework.

The Relationship Between Mindfulness and Executive Function

Executive function (EF) is an essential factor for school success and can predict academic performance beyond general levels of intelligence (Blair, 2002). EF refers to a variety of cognitive processes, including both cognitive and affective constructs, such as planning, working memory, attention, inhibition, and self-regulation (Goldstein, Naglieri, Princiotta, & Otero, 2014). Diamond (2012) identifies three core components of EF, which are inhibition, working memory, and cognitive flexibility. Diamond (2012) specified that the three components of EF permit the development of complex EF constructs, such as reasoning, planning, and problem solving.

Mindfulness training is known to provide a number of benefits to brain regions implicated in EF for adults. For example, preliminary findings between 2005 and 2009 showed correlations between mindfulness training and increased thickness in cortical structures associated with attention, working memory, processing sensory input, EF, and error monitoring, which is the correction of differences between an intended and executed response (Taylor, Stern, & Gehring, 2016) (e.g. Hölzel et al., 2008; Lazar et al., 2005; Short et al. 2007; Luders, Toga, Lepore, & Gaser, 2009). Furthermore, a study assessed the effects of an eight-week MBSR training on adults' brain regions associated with memory and the neuro-imaging results revealed increased grey matter density in the hippocampus, which was associated with learning and memory (Hölzel et al., 2011). Lastly, maintaining a state of mindfulness has been shown to increase alertness to environmental sensory data that is usually controlled by automatic cognitions and help individuals experience both negative and positive cognitions, which is known to increase objective assessments and promote flexibility instead of responding automatically to different experiences (Linden, 1973; David, Lynn, & Das, 2013; Thomson & Waltz, 2008).

For children, EF emerges early in childhood and can predict EF competencies later in life (Diamond, 2016). It is important to facilitate EF skills in children early in life. Otherwise, EF deficits in childhood have been shown to have a negative impact on academic, social-emotional, and adaptive functioning later in life (Otero, Barker, & Naglieri, 2014). Since EF is highly influential in predicting children's competencies later in life, it is critical to facilitate EF skills early in life to prevent future maladaptive behaviours and decreased mental functioning.

Mindfulness training has been shown to potentially enhance EF skills for children. A study by Schonert-Reichl et al. (2015) shows the potential benefits of mindfulness on EF for children. They found that children who participated in the MindUp Curriculum displayed enhancements in attention and the ability to restrain distractions when performing computer tasks compared to children who participated in a social responsibility program. Furthermore, Flook et al. (2010) conducted a study with second and third grade children who participated in an eight-week mindfulness training program, called mindful awareness practices (MAPs), or a control condition, consisting of a silent reading period. Generally, they found no group effect, however, children with weaker initial EF showed significant improvement in EF overall, as well as attention shifting, monitoring, and initiating after participating in MAPs. Additional empirical evidence regarding mindfulness and EF for children and adolescents exist for those with attention-deficit hyperactivity disorder (ADHD), students with autism spectrum disorders (ASD), as well as with numerous other disorders of childhood (e.g., Otero et al., 2014; Zylowska et al., 2008; Bogels, Hoogstad, van Dun, De Shutter, & Restifo, 2008). However, the conclusions of these studies cannot be transferred to children who do not have any mental health problems.

There is additional research containing samples with adults that assesses the effects of mindfulness on EF. For example, Zeidan, Johnson, Diamond, David, and Goolkasian (2010) conducted a study with 63 college students who participated in four mindful sessions and found that mindfulness training improved working memory, attention, and EF abilities. Gothe, Pontifex, Hillman, and McAuley (2013) similarly found that college women who engaged in mindfulness practices demonstrated shorter reaction times and increased accuracy on inhibition and working memory tasks. These studies provide evidence for the positive effects of mindfulness on EF for adult populations and may suggest similar potential to enhance EF for children. Therefore, the present study will add to the current literature and seek to assess the effects of mindfulness on children's EF, more specifically on the three core components of EF mentioned, including inhibition, working memory, and cognitive flexibility.

Effects of Mindfulness on Emotional Regulation

The ability to regulate and control emotions is a crucial skill for children to develop and is a significant contributor to academic success. Regulating emotions is a form of self-regulation, which supports school readiness, learning, and helps to maintain positive social relationships (Blair, 2002). Self-regulation involves modulating feelings, thoughts, and behaviours (Flook, Goldberg, Pinger, & Davidson, 2015). Children's ability to regulate their emotions is critical because of its empirical links to children's academic success, school adjustment, social relations, personal well-being, and mental health (Denham, 2015). However, emotional learning in schools has become less of a priority, as schools place heavy emphasis on academic testing (Barrie, 2011).

Facilitating and encouraging children's emotional regulatory skills has been shown to predict academic success (e.g. Carlton, 1999; Howes & Smith, 1995; Izard et al., 2001; Jacobsen & Hofmann, 1997; O'Neil, Welsh, Parke, Wang, & Strand, 1997; Pianta, 1997; Pianta, Steinberg, & Rollins, 1995; Shields et al., 2001). Children who learn emotional competence have more success in developing positive attitudes about school and have shown improvements in grades and academic achievement (Denham, 2006). On the other hand, when children fail to develop the necessary skills to regulate their negative emotions, they are at risk for academic failure (Cytryn, McKnew, Zahn-Waxler, & Gershon, 1986; Denham, Zahn-Waxler, Cummings, & Iannotti, 1991; Robins & Rutter, 1990; Roff & Ricks, 1970; Rubin & Clark, 1983; Sroufe, Schork, Motti, Lawroski, & LaFreniere, 1984). For this reason, it is imperative for children's long-term well-being and academic success to have programs that can foster such emotional competencies so that children can develop the skills necessary to be successful in school (Denham, 2006).

The literature has shown that maintaining and practicing mindfulness can encourage the development of emotional regulatory skills in adults. For example, maintaining and practicing mindfulness has been demonstrated to help adults regulate emotions, such as being aware of and expressing emotions, and to control the intensity and duration of emotion-related arousal (Meiklejohn et al., 2012). Greeson (2009) further conducted a meta-analysis of 52 studies between 2003 and 2008 that demonstrated the most thorough and theoretical support on the effects of mindfulness on the brain, mind, and body. The results of the studies demonstrated that mindfulness training was associated with reduced emotional distress, a more positive outlook and improved quality of life. Further, neurological research supports the use of mindfulness training to enhance brain regions associated with emotional regulation. For example, a study by Davidson et al. (2003) demonstrated that through an eight-week mindfulness training program, brain activity decreased in regions associated with negative emotion and increased in regions associated with positive emotion. The literature demonstrates that mindfulness training can be used to support competencies in emotional regulation for adults.

Research evidence further supports mindfulness as a means to facilitate positive benefits on emotional aspects for children and adolescents. For example, Schonert-Reichl and Lawlor (2010) conducted a quasi-experimental control group study on the effects of a mindful based program for social and emotional well-being in six elementary schools for children between the ages of 9 and 12. Results showed that children who participated in the mindful group experienced significant increases in positive emotions. Teachers also rated children in the mindful group with greater emotional competence as compared to children from a wait-listed group. Similarly, Semple, Reid, and Miller (2005) conducted a study with 5 urban elementary school children between the ages of 7 to 9 years. Children were either assigned to a mindfulness-based cognitive program suited for children or were assigned to a wait-list group. The results revealed significant reductions in anxiety and anger management problems, which were also noted by the parents of the children. The limitations of these studies are that children from the intervention groups were compared to wait-list groups and they assessed student behaviours based on teacher and parent ratings rather than direct observations. Teachers and parents were not blind to the study, which can create additional bias for their ratings. Another study by Wall (2005) showed improvements in emotional regulation for early adolescent children. The study administered a five-week MBSR program modified with Tai Chi to 11 students between the ages of 11 to 13 years. Results showed children feeling calmer, less reactive, and had an enhanced sense of well-being. Further research regarding the effects of mindfulness on emotional aspects for children and adolescents also reported reduced worry, hostility, anxiety, ADHD symptoms, negative affect, depressive symptoms and showed increases in emotional regulation (e.g. Bootzin & Stevens, 2005; Beauchemin, Hutchins, & Patterson, 2008; Sibinga et al., 2011).

The research literature supports the training of mindfulness for children to enhance competencies in emotional regulation. However, the literature contains a few limitations that must be considered before general conclusions can be made. For instance, the research evidence contains issues of sample size, wait-list groups, and clinical samples of children, such as ASD and ADHD. The results from the literature should be replicated in larger sample sizes to establish conclusive reports on the effects mindfulness on emotional regulation. For example, the study by Semple et al., (2005) contained only 5 children and the study by Wall (2005) contained only 11 children. Furthermore, the studies presented in the literature compare the intervention groups to wait-list groups or to the absence of a control group. Finally, it is not known whether the results of the studies with samples containing children with mental health problems can be transferred to children without any mental health problems. Therefore, the current research will add to the array of literature that supports mindfulness as an approach to promote emotional regulation skills in all children compared to an active control condition. Deficits in self-regulation can significantly interfere with learning, thus, the ability to enhance and strengthen emotional regulatory skills warrants further investigation (Flook et al., 2015).

The Benefits of Mindfulness on Physiological Stress

Research with adults analyzing the effectiveness of mindful practices has suggested a link between mindfulness and physiological systems related to stress (e.g., Davidson et al., 2003;

Tang et al., 2007). For example, a state of mindfulness leads to increased clarity and attention, which can lead to reduced reactivity to bodily physiological stress responses (Meiklejohn et al., 2012). Evidence reveals that reduced stress as a result of mindfulness training is correlated with decreased grey matter density in the amygdala, which is known to regulate stress responses (Hölzel et al., 2008). A study by Davidson et al. (2003) demonstrated that when participants engaged in an eight–week mindfulness program, they reported a reduced sense of stress and reported enhanced well-being and immune functioning. Furthermore, mindfulness training has been shown to reduce physiological responses to stress, including blood pressure (Carlson, Speca, Faris, & Patel, 2007; Palta et al., 2012) and heart-rate (Zeidan et al., 2010; Ainsworth et al., 2015). Blood pressure (BP) is defined as the pressure or force of blood against the inner walls of vessels as blood flows through the circulatory system, and heart rate (HR) is defined as the speed of the heartbeat and is measured in beats per minute (Bell, 2015). However, there is a lack of information as to how mindfulness practices can influence BP and HR in children.

There is increased recognition of the significance of self-regulation and stress reactivity in determining healthy cognitive, social, and emotional development in childhood (Oberle, Schonert – Reichl, Lawler, & Thompson, 2012). For children, excessive stress can damage the structure of the developing brain, which can lead to vulnerabilities to problems such as behaviour, learning, and overall health (National Scientific Council on the Developing Child 2007; Meiklejohn et al., 2012). Additionally, prolonged childhood stress can impact well-being, general functioning, and factors related to learning, such as working memory and executive function (Meiklejohn et al., 2012). Children may be at risk of developing stress-related medical conditions due to anxiety and stress from life inside and outside of the classroom, such as peer conflicts, family disturbances, socio-cultural factors, and physical and mental health risk factors

(Bell, 2015; Meiklejohn et al., 2012). Therefore, it is crucial to find an approach that can be used by children to decrease stress in order to prevent deficiencies in mental health and well-being.

Langer (2000) encourages mindfulness as an approach to reduce levels of stress for children. Through the practice of mindfulness, children would be able to increase awareness, creativity, and cognitive flexibility, which can improve children's learning and performance by reducing stress and increasing children's engagement in the lessons being taught in the classroom (Langer, 2000). Since children spend many hours in school, mindfulness-based school programs can be implemented as a tool for children to reduce their levels of stress. Additional research shows that mindfulness has been found to provide benefits to students in the classroom. For example, Napoli, Krech, and Holley (2005) conducted a study with 194 elementary school children in grades 1 to 3. Children were randomly assigned to the Attention Academy Program (AAP) or to the control group (no AAP training). The AAP training consisted of children paying attention to the breath, movement activities, and sensory stimulation, which were used to facilitate "being in the moment." Activities included body scans and body movements. The results of the study demonstrated that students from the AAP training group reported being better able to relax and focus, as well as having reduced anxiety before a test. This study supports the use of mindfulness as an approach to reduce the perceived feelings of stress for children. However, the literature does not specify whether mindfulness has a direct effect to physiological levels of stress, as assessed by direct measures of BP and HR, in children.

The current literature, however, provides support for the use of mindfulness training on BP and HR for adults. For example, Bell (2015) conducted a study on a sample of university students and urban residents who practiced mindfulness 30 minutes per day, four times per week, for 12 weeks. The study used mindfulness meditation that allowed participants to close their eyes while focusing on relaxation and nonjudgemental awareness. The eyes-closed relaxation helped significantly reduce anxiety, BP, and HR. Bell (2015) suggested that mindfulness serves as an inexpensive, nonpharmacological way of improving the physical health of university students and urban residents who may be at risk of anxiety, depression, an inability to pay attention, or even stress-related illnesses because of the demands of school and quality of life. Further research is needed to assess whether the observed benefits of mindfulness on BP and HR for adults, as demonstrated in Bell's (2015) study, can be extended to younger children.

Currently, there is a dearth of research that contains child samples which can provide empirical support for the use of mindfulness as an approach to decrease physiological stress levels, as indexed by BP and HR. However, studies support the use of a meditation intervention as an approach to reduce BP and HR for adolescents. For example, Black, Milam, and Sussman (2009) did a review of meditation interventions on youth's BP and HR levels and they were only able to report findings from five studies. The studies used transcendental meditation, a silent mantra meditation, as an intervention to assess adolescents' BP and HR levels. Of the five studies, four of them revealed that the meditation decreased systolic pressure relative to a control condition (e.g. Barnes, Treiber, & Davis, 2001; Barnes, Treiber, & Johnson, 2004; Barnes, Davis, Murzynowski, 2004; Barnes, Pendergast, Harshfield, & Treiber, 2008). In regards to diastolic pressure, there were no consistent findings from the studies. Two studies found only marginal reductions in diastolic pressure relative to a control condition (e.g. Barnes et al., 2001; Barnes et al., 2004) and two studies found no significant differences in diastolic pressure compared to a control condition (e.g. Barnes et al., 2004; Barnes et al., 2008). For heart rate, there was only one study that found significant decreases in HR (e.g. Barnes et al., 2001). The studies which report findings on diastolic pressure and HR remain inconsistent, and therefore, the results to BP and HR cannot be conclusive. Additionally, the studies discussed in this review are limited because the samples contained adolescents, all of whom were of African-American descent. Therefore, the results cannot be generalized to other populations and to younger children.

The current literature demonstrates inconsistent evidence in regards to the application of a meditation intervention for reducing BP and HR levels in adolescents. Moreover, the results from the literature should not be extended to confirm mindfulness as an effective intervention to reduce BP and HR levels in children. Further research is warranted to validate whether mindfulness training can be used as an intervention to positively affect BP and HR levels in children. Despite evidence that mindfulness can enhance well-being for adults and some support in the literature for using mindfulness as an intervention with adolescents, the underlying mechanisms of how it contributes to physical well-being are not yet well understood for younger children (Brown, Ryan, & Creswell, 2007; Oberle et al., 2012). The only other available research with children focuses on how mindfulness effects other physiological systems, such as sleep, tiredness, aches and pains (e.g. Wall, 2005; Biegel et al., 2009; Broderick & Metz 2009). Therefore, the current research will add to the literature and investigate whether mindfulness can be used as an approach to effect children's BP and HR levels.

Effects of Mindfulness on Children's Academic Performance

To be successful in school, it takes creativity, flexibility, self-control, and discipline (Diamond, 2016). Central to all those characteristics are skills in EF and emotional regulation, including showing creativity, not providing impulsive responses, being able to change perspectives, resist temptations, and staying focused (Diamond, 2016). The capacity to self-regulate and to have attentional control is associated with school readiness and academic achievement (Black & Fernando, 2014). Therefore, early childhood is a stage that requires the development for training of such skills. Despite evidence highlighting the importance of such skills to be academically successful, these skills are not explicitly taught in schools. Teachers tend to provide lessons that generally emphasize academic knowledge and testing (Flook et al., 2015). There is an increased interest among educators, parents, and policymakers in directing more attention to children's social and emotional development in addition to academic skills; however, there is no agreement on what constitutes the best strategy and method for promoting these positive qualities in children (Greenberg, Domitrovich, & Bumbarger, 2001). Mindfulness-based practices have provided some support to the training of these skills in children (Diamond & Lee, 2011).

Family–related conflicts, issues with peers, and vulnerabilities to physical and mental health are just some of the burdens that children come to school with that may impair learning (Meiklejohn et al., 2012). Evidence supports implementing mindfulness training in schools as a method to foster non-stressful classroom environments and as a way to increase stress resilience to promote healthy brain development. For example, Campion and Rocco's (2009) conducted a preliminary qualitative study on 54 children between the ages of 7 and 12 years. They conducted semi-structured open-ended interviews on children after participating in meditation practice in their schools. The interviews revealed that half of the students reported better concentration on school work after the meditative practices. Another qualitative study by Rosaen and Benn (2006) conducted semi-structures interviews on 10 seventh grade students who participated in transcendental meditation for one year. The results demonstrated that children who participated in transcendental meditation increased in alertness, self-control, self-reflection, flexibility in emotional response, and improved academic performance. Furthermore, a study by Napoli

(2004) showed overall improvements in many aspects of classroom and personal functioning of students, as reported by teachers, after participating in an eight-week mindfulness course. The current literature highlights the effectiveness of such interventions to be utilized for the development of concentration, critical thinking skills, and creativity (Brady, 2007; Dawson, 2006; Hart, 2004; Langer & Moldoveneau, 2000; Napoli, 2004; Orr, 2002; Black & Fernando, 2014). Concentration is crucial for students to absorb information and requires skills in contemplative skills, which needs to be learnt and developed (Campion & Rocco, 2009). The current literature suggests that the only the level of concentration may be considered as the underlying mechanism as to why mindfulness has positive effects on academic performance in children. Further research needs to be extended to assess the direct relationship of mindfulness training to academic performance.

From the available research, it can be gathered that mindfulness has the potential to improve academic outcomes for children. Although the literature is scarce, it demonstrates that mindfulness training has the ability to directly affect children’s capacity to do well in specific subject areas taught in the classroom. For example, a study by Shoval (2011) evaluated how mindful movements affected children’s ability to learn about angles (geometry) for 216 children in grades 2 and 3. Children learned about angles through the use of movements compared to a control group that consisted of conventional teaching. The results of the study showed that children who participated in mindful movements showed significant improvements in learning about angles compared to a control group. Although these results are promising, the teachers were not blind to the conditions, as teachers were required to teach these movements to their students. Another study by Bakosh, Snow, Tobias, Houlihan, and Barbosa-Leiker (2016) implemented an eight-week MBSR protocol for 93 children in grade 3. The MBSR protocol were pre-recorded and children had to listen to the audio-guided program 10-min-per-day. The protocol facilitated awareness of senses, thoughts, and emotions as well as periods of silence, relaxation, and breathing practices. The study assessed whether this mindfulness protocol improved grades in subject areas such as reading, science, math, writing, spelling and social studies for 93 children in grade 3. The results of the study were compared to a control group, without disrupting teacher operations. The results revealed significant improvements in subject areas including reading and science, but not for the other subjects mentioned. Lastly, Singh et al. (2016) conducted a study on the effects of Samantha Meditation on active academic engagement and math performance for students with ADD/ADHD. The Samantha Meditation involved breathing exercises and meditation training to help children focus on the task at hand. There were only four grade 5 children who participated in the study. The resulted demonstrated significant correlations between active engagement in math instruction and meditation training and practice. Furthermore, there was a significantly increased average percentage of math problems solved correctly, which was directly correlated with meditation training and practice.

Though these studies show promise, there is not enough empirical evidence to support the conclusion that mindfulness directly affects academic outcomes in specific subject areas taught for children. The studies mentioned are limited based on issues of sample size and recruitments of younger children. It is not known whether the results can be generalized to other grades. Results need to be replicated in larger samples with all children in order to make general conclusions on the effects of mindfulness on academic performance. Also, these studies tended to have no active control condition or the absence of a control condition. Further studies on mindfulness in regards to academic performance contain child samples who have behavioural and psychological deficits (e.g. Semple et al., 2010; Haydicky, Wiener, Badali, Milligan, &

Ducharme, 2012; Black & Fernando, 2014), such as the study by Singh et al. (2016) which had participants with ADD/ADHD. However, the results of these studies should not be transferred to all child populations. With the increased interest in implementing mindfulness-based programs in schools, it is important to understand whether mindfulness has any direct effects on academic performance and whether mindfulness has the ability to improve grades for children who are struggling in specific subject areas. Hence, the present study will compare a mindfulness condition to an active control condition to evaluate the writing outcomes of children from grades 2 to 4 and grades 7 to 8.

Objectives of the Current Research

The present study assessed the effects of a Mindful Me! program on children's emotional regulation, EF, physiological stress levels, and subsequent academic outcomes. Since the literature on mindfulness lacks active control groups, a Social Skills program was implemented in the present study. Both the Mindful Me! and the Social Skills program facilitate the development of some skills for children, however the Social Skills program lacks the mindfulness components, which includes deep breathing, body scans, relaxation, staying in the present moment, and acceptance of any thoughts or feeling without judgement. By comparing the Mindful Me! program to an active control group (i.e., Social Skills), analysis of the mindfulness components covered in the Mindful Me! program can be indicative as the cause of change in EF, emotional regulation, stress, and academic outcomes for children in the mindfulness condition. In addition, analyses of age group differences will be conducted to assess whether mindfulness should be considered from a developmental framework. For instance, children from grades 2 to 4 (younger) will be compared to early adolescent children from grades

7 to 8 (older). This exploratory analyses will provide evidence as to whether mindfulness effects children in varying developmental stages.

The current study focused on four domains: EF, emotional regulation, physiological stress levels, and academic outcomes. There were four hypotheses generated based on previous literature. This study also had a novel exploratory component in assessing age group differences between younger (ages 7-10) and older children (ages 12-13). Accordingly, all four hypotheses considered age group differences in response to the mindfulness program. It was expected that:

1) Children from the Mindful Me! condition would show improvements in EF skills compared to children from the active control condition, as assessed by improved scores in the EF tasks from pre- to post-test.
2) Children from the Mindful Me! condition would acquire greater competencies in emotional regulation skills compared to children from the active control condition, as assessed by the self-report measures of emotional regulation from pre- to pos-test.
3) Children from the Mindful Me! condition would have reduced levels of stress, as demonstrated by lower levels of BP and HR from before the Mindful Me! session to after the Mindful Me! session, compared to children from the active control condition.
4) Children from the Mindful Me! condition would obtain higher average grades, as measured by the journal writing exercises, than children from the active control condition.

Method

Participants

Participants for the current study were recruited from three schools from the Waterloo and Cambridge regions of Ontario, Canada. Principals from the Waterloo Region District School Board (WRDSB) were contacted by telephone to participate in the present study. An information letter was sent home with children so that parents may consent to their participation. The school was provided with $10 per returned consent form plus $50 donated to the school. The information letter explained to parents what their child(ren) would be asked to do as participants and set out their rights and responsibilities. Children whose parents signed the consent forms were verbally asked to participate. If children gave verbal assent, they participated in the study. They were also informed that they could withdraw from the study without penalty at any time. The University Research Ethics Board (REB) of Wilfrid Laurier University reviewed and approved the implementation of this research study and school board approval was also granted.

There were a total of 60 grade 2 to 4 (7-10 years) younger children and 48 grade 7 to 8 (12-13 years) older children who returned their consent forms to participate in the current study. However, nine grade 3 to 4 participants and one grade 8 participant had to drop from the study for different reasons. Specifically, one grade 8 participant did not complete the post measures because she suffered from a concussion after the program was complete. One grade 3 participant and one grade 4 participant moved to another school during week 8 and was not able to complete the post measures. Three grade 3 participants did not want to participate in any of the sessions and were excluded from the study. Two grade 4 participants were attending other programs at their schools that prevented them from attending the sessions. And one grade 4 participant did not want to participate in the sessions anymore starting from week 7, resulting in incompletion of the post measures. As a result, there were 51 total younger children from grades 2 to 4 (Mean Age = 8.51, *SD* = .731). For younger children, there were 24 males and 27 females (52.9%). There were 47 total older children from grades 7 to 8 (Mean Age = 12.68, *SD* = .471) who participated in the current study. For older children, 25 were male and 22 were female (46.5%). All of the children from grades 7 to 8 were from one school located in Waterloo, Canada. There were 31 children from grades 2 to 4 from one school and 20 children from grades 3 to 4 from another school. Both schools are located in Cambridge, Canada. One school contained only four grade 2 students. This study initially sought out to include children only from grades 3 to 4, however, one of the classes from the schools was a split class of grade 2 and 3. It was assumed that a teacher provided consent forms for children in grade 2 from that split class.

Table 1 illustrates the total frequency of participants by age and gender distributed in each condition (Mindful Me!, control) by the end of the study, who attended four or more sessions and competed all of the pre- and post-test measures. Parents also self-identified their child(ren)'s ethnic backgrounds. There were 67 participants who self-identified as Caucasian (68.4%) (e.g. White, Caucasian, WASP), 8 as European (8.2%) (e.g. Greek, British, German, Scottish, Portuguese, Irish, Hungary), 5 as South Asian (5.1%) (e.g. Indian, Pakistan), 4 as Asian (4.1%) (e.g. Chinese, Korean, Japanese, Han), 1 as Middle Eastern (1%) (e.g. Iranian), 1 as Hispanic (1%), and 12 as unknown (12.2%) (e.g. Canadian, N/A).

Attendance

The two programs administered in the current study ran for eight weeks with one 30-minute session per week. Participants were excluded from the analyses on the criteria based on missing more than four sessions. No participants met this criterion, and thus all were included in the analyses.

Younger Mindful Me! Attendance. There were 19 (67.9%) younger children who attended all Mindful Me! sessions, 5 (17.9%) missed 1 session, 3 (10.7%) missed 2 sessions, and 1 (3.6%) missed 3 sessions.

Younger Social Skills Attendance. There were 19 (82.6%) younger children who attended all Social Skills sessions, 2 (8.7%) missed 1 session, 1 (4.3%) missed 2 sessions, and 1 (4.3%) missed 3 sessions.

Older Mindful Me! Attendance. There were 6 (25%) older children who attended all Mindful Me! sessions, 11 (45.8%) missed 1 session, 6 (25%) missed 2 sessions, and 1 (4.2%) missed 3 sessions.

Older Social Skills Attendance. There were 5 (21.7%) older children who attended all Social Skills sessions, 5 (21.7%) missed 1 session, 9 (39.1%) missed 2 sessions, 3 (13%) missed 3 sessions, and 1 (4.3%) missed 4 sessions.

Missing Data

Behaviour Rating Inventory of Executive Function (BRIEF) for Parents. Due to limited returned BRIEFs after the two programs, pre- and post-test measure comparisons were analyzed based on 9 BRIEFs from the younger participants from the active control condition, 10 BRIEFs from younger children from the Mindful Me! condition, 12 BRIEFs from older children from the active control condition, and 10 BRIEFs from older children from the Mindful Me! condition.

Blood Pressure and Heart Rate Data. For week 2, the analyses of blood pressure and heart rate data with the younger children should be interpreted with caution. Blood pressure and heart rate data was collected from only 3 younger participants from the active control condition, whereas there was blood pressure and heart rate data collected from 20 younger participants from the Mindful Me! condition. On week 2, the blood pressure monitor produced a number of errors when collecting blood pressure and heart rate data from the younger children from the active control condition. Therefore, comparisons for the younger children between the active control and Mindful Me! conditions were limited.

Measures

Demographic Information. Information on demographics were collected via the informed consent forms for parents. Information on gender, age, grade, and ethnic background were collected.

Mindful Attention Awareness Scale for Children (MAAS – C). To assess mindful attention, the study administered the Mindful Attention Awareness Scale for Children (Benn, 2004) (see Appendix A). Brown and Ryan (2003) originally developed the Mindful Attention Awareness Scale (MAAS) for adults and Benn (2004) modified the MAAS to use with children by changing the language to make it easier for children to understand. For example, one of the items from the MAAS was changed from 'I tend not to notice feelings of physical tension or discomfort until they really grab my attention' to 'Usually, I do not notice if my body feels tense or uncomfortable until it gets really bad' for the MAAS – C. Furthermore, the six-point Likert-type scale from the MAAS was changed to a more child friendly format. For instance, the MAAS for adults has a response format that ranges from 1 = almost always, 2 = very frequently, 3 = somewhat frequently, 4 = somewhat infrequently, 5 = very infrequently, and 6 = almost never. The MAAS for children has a response format that ranges from 1= almost never, 2= not very often at all, 3= not very often, 4= somewhat often, 5= very often, and 6= almost always. Items were reverse-scored and averaged with higher scores indicating higher mindfulness and lower scores indicating lower mindlessness.

Lawlor, Schonert-Reichl, Gadermann, & Zumbo (2009) found that the MAAS – C was positively and significantly related to classroom autonomy, academic efficacy, and personal achievement goals. Additionally, they found that the MAAS – C is negatively and significantly related to depression, anxiety, rumination, and negative affect. The MAAS – C has a high internal consistency with Cronbach's alpha reported as .84 for children between grades 4 to 7 (Lawlor et al., 2009). For the current study, Cronbach's alpha was reported as .85.

Cognitive Assessments

Behaviour Rating Inventory of Executive Function (BRIEF) for Parents. To assess executive function, the BRIEF (Gioia, Isquith, Guy & Kenworthy, 2012) was distributed to parents/guardians of children before and after the programs. The BRIEF measures eight clinical scales, two validity scales, and an overall Global Executive Composite score, reported by parents/guardians. The eight clinical scales of Inhibit, Shift, Emotional Control, Initiate, Working Memory, Plan/Organize, Organization of Materials, and Monitor were from two broader components of Behavioural Regulation and Metacognition. An example item from the Working Memory scale includes: "has trouble remembering things, even for a few minutes" and an example from the Inhibit scale includes: "talks at the wrong times." Items are scored as occurring 'never', 'sometimes', or 'often'. A score of 1 is assigned to behaviours labelled 'never', a score of 2 is assigned to behaviours labelled as 'sometimes', and a score of 3 is assigned to behaviours labelled as occurring 'often'. Scores are computed into T-scores and the resulting percentiles of executive function were identified. T-scores and percentiles are based on sex and age. Average scores are 50, with a standard deviation of 10. To analyze their scores on the scales, post-test mean scores were subtracted from pre-test mean scores to calculate mean differential scores for each of the scales under study. Mean differentials are displayed in Table 3. Negative integers represent a decrease in BRIEF score, meaning there is an improvement in executive function. Positive integers represent an increase BRIEF score, which means an increase in executive dysfunction.

Mahone et al. (2002) reported the mean internal consistency ratings for clinical populations using the BRIEF range from .82 to .98. Additionally, they reported the three-week test–retest correlations for clinical populations range from .72 to .84. Cronbach's alpha for the current study was .95.

Wechsler Intelligence Scale for Children (WISC-IV) - Digit Span Subtest. To assess working memory, the digit span subtest was used from the WISC-IV (Wechsler, 2003; ages 7–17 years). The digit span subtest includes both the Forward Digit Span test and the Backward Digit Span test (see Appendix B). For the Forward Digit Span test, participants heard a sequence of random numbers then were required to repeat the sequence verbally. The first trial contains two digits and gets progressively longer, up to a maximum of nine digits. There are two trials for each sequence length. Once the participant successfully repeats at least one of the sequences, the sequence length increases by one digit. Testing continues until the participant fails to repeat both trials of a sequence length. Participants were scored based on how many digits they were able to recall successfully and the maximum score they can receive is a 9. Participants were also scored one point for each correct repetition for a maximum score of 16.

After completion of the Forward Digit Span test, participants were then asked to complete the Backward Digit Span test. In this test, participants heard a sequence of random numbers and had to repeat the sequence verbally in backwards order. The Backward Digit Span also begins with sequences of two digits and the sequences increase progressively in length by one digit for every two trials. For the backwards test, participants were also scored based on how many digits they were able to recall successfully and the maximum score they can receive is an 8. Participants were also scored one point for each correct repetition for a maximum score of 16.

Before testing began for the forward and backward tests, participants were given one example and one practice trial. Once participants answered the practice trial correctly, testing began. The length of sequence, the total number of trials correct, and the total raw digit span scores from the forward and backward tests served as the dependent variables.

Dimensional Change Card Sort (DCCS) Task. The Dimensional Change Card Sort (Zelazo & Reznick, 1991) task was developed to assess children's ability to flexibly shift attention from one source of information to another as task demands change and is a core aspect of executive function (Garon, Bryson, & Smith, 2008).

In the DCCS task, participants sorted a set of picture cards into boxes with target cards on them (e.g., red rabbit and blue boat). Participants sorted test cards first by one dimension (e.g., shape) and then sorted the same cards by a second dimension (e.g., color). The DCCS consists of three phases, which includes the preswitch, postswitch, and border. Participants first sorted cards based on colour during the preswitch phase (six trials). In this example, the red boat on the card matched the red rabbit on the box. The postswitch phase (six trials) required participants to sort by shape. In this example, the red boat matched the blue boat on the box. After, the border phase (12 trials) had participants shift between dimensions. For example, cards that have a black border requires participants to sort only by colour, regardless of the shape (i.e. rabbit or boat) shown on the card. Cards that contained no black border required participants to sort only by shape, regardless of the colour (i.e. red or blue) shown on the card.

The DCCS task has shown excellent test–retest reliability (ICC = .92) as well as good convergent and discriminant validity (Zelazo et al., 2013).

Stroop Task. To assess inhibition, participants completed a Starfish Task, which is a modified stroop task for children. The Starfish Task involves looking at a picture of a blue starfish and a yellow starfish. The pictures are displayed on a laptop using a SuperLab software. On the keyboard of the laptop, a blue sticker was placed on the letter ‘Q’ (left side of the keyboard), whereas a yellow sticker was placed on the letter ‘P’ (right side of the keyboard). Participants were simply asked to press the blue button once they saw a blue starfish and the yellow button once they saw a yellow starfish.

During the Starfish Task, a crossed fixation point appears, followed by a starfish that is either yellow or blue on either the left or the right side of the screen. Participants were encouraged to respond as quickly as possible and a new starfish appeared as soon as they responded. There are a total of 40 trials that included congruent and incongruent tests in random order. During the congruent test, the blue starfish appeared on the left side of the screen, which matched the location of the blue button (on the left side of the keyboard). Similarly, a yellow starfish appeared on the right side of the screen, which matched the location of the yellow button (located on the right side of the keyboard). During an incongruent test, the blue starfish appeared opposite to the location of the blue button on the keyboard, which is the right side of the screen. The yellow starfish appeared on the left side of the screen, opposite to the location of the yellow button on the keyboard.

Before the Starfish Task started, participants performed a practice test consisting of 20 trials of congruent and incongruent tests in random order, so they can become familiar with the rules of the task. Once they completed the practice test, children completed the Starfish Task consisting of 40 trials of congruent and incongruent tests in random order. Participants were scored based on whether they successfully pressed the correct button during the congruent and incongruent tests (maximum score of 40) and were assessed on their reaction times.

Emotional Assessments

Mood and Anxiety Symptom Questionnaire – Anxiety Arousal (MASQ – AA). The original Mood and Anxiety Symptom Questionnaire (MASQ) (Watson et al., 1995) contains 90 items. The MASQ is used to assess anxiety and depressive symptoms based on the tripartite theory of anxiety and depression (Hankin, 2008; Clark & Watson, 1991). For the present study, 10 items from the MASQ were extracted to measure anxious arousal (see Appendix C). The anxious arousal subscale assesses physiological arousal symptoms and are indicated as being the highest loading on the anxious arousal factor (Watson et al., 1995). The MASQ – AA contains 10 items on a Likert scale ranging from 1 = not at all, 2 = a little bit, 3 = moderately, 4 = quite a bit, and 5 = extremely. The score was the average item scores of all items ranging from 1 to 5. Reliability and validity of the MASQ has been demonstrated in previous studies (e.g., Hankin, Wetter, Cheely, & Oppenheimer, 2008; Watson et al., 1995). Cronbach's alpha for the current study was .81 for the MASQ – AA.

Children's Response Styles Questionnaire - Rumination Scale-Revised (CRSQ – RSR). The CRSQ – RSR is depression focused and is based on the Response Styles Questionnaire (Nolen-Hoeksema & Morrow, 1991). The Children's Response Styles Questionnaire uses 25 items clustered into three response styles of rumination, distraction, and problem solving (Hankin, 2008). The CRSQ – RSR is an extended version of the rumination subscale of the Children's Response Styles Questionnaire (Abela, Vanderbilt, Rochon, 2004). The CRSQ – RSR contains items that are answered on a 4-point scale ranging from 1 to 4 (see Appendix D). An example includes, "When I am sad, I think: Why can't I handle things better?" A higher score indicates higher levels of rumination. The scale has been shown to be valid and possess moderate internal consistency (Abela, Brozina, & Haigh, 2002). The Cronbach's alpha for the current study was .83 for the CRSQ – RSR.

Resiliency Inventory (RI). To assess optimism and emotional control, the RI was used for the present study (see Appendix E). The RI was first created by Noam and Goldsteirn (1998) and was later modified by Song (2003). The RI assesses six dimensions of resilience, including optimism, self-efficacy, relationships with adults, relationships with peers, interpersonal sensitivity, and emotional control (Schonert-Reichl & Lawlor, 2010). For the purposes of this study, only the optimism and emotional control subscale was used. Items 1-10 concern the optimism subscale, which assesses a person's positive perspective on the world and the future (Schonert-Reichl & Lawlor, 2010). Items 11-14 relate to emotional control, which assesses how an individual regulates their emotions. Participants were asked to rate each item on a five-point Likert-type scale ranging from 1= not at all like me to 5 = always like me. From the optimism subscale, 5 items were reverse scored and 4 items were reverse scored for the emotional control subscale. Higher scores represent greater optimism and emotional control. Cronbach's alpha for the optimism subscale has been shown to be .84 and .61 for the emotional control subscale (Song, 2003). For the current study, the optimism subscale had a Cronbach's alpha of .64 and for the emotional control subscale, the Cronbach's alpha was .53.

Physiological Assessments

Blood Pressure (BP) and Heart Rate (HR). Blood pressure readings are based on two measures called systolic and diastolic pressure. Systolic is the measure that indicates the pressure force when the heart contracts and pushes out blood, and diastolic indicates when the heart relaxes between heart beats (Heart and Stroke, 2014). HR was measured as beats per minute. BP and HR were indicated by a Digital Blood Pressure Monitor (model#: 20-2300) with automatic inflation.

The monitor provides accurate and reliable measurement of systolic and diastolic blood pressure and heart rate.

Normal systolic blood pressure for children aged 6 to 9 ranges from 97-115 and the normal diastolic pressure ranges from 57-76. For children aged 10-11, the normal systolic pressure ranges from 102-120 and the normal diastolic pressure ranges from 61-80. For children aged 12 to 15, the normal systolic pressure ranges from 110-131 and the normal diastolic pressure ranges from 64-83. In regards to heart rate, children aged 6 to 11 have a normal heart rate of 75-118 beats per minute. For children aged 12 to 15, they should have a normal heart rate ranging from 60-100 beats per minute (Chameides, Leon, Samson, Schexnayder, & Hazinski, 2011).

The BP procedure was taken during weeks 2, 6, and 8. BP and HR were collected from participants from both the Mindful Me! and Social Skills conditions to indicate any changes in physiological stress outcomes before they start the sessions and after they completed the sessions. The participant was asked to sit comfortably and relax for 5 minutes. They were asked to rest their left arm on a table level to their heart and were asked to sit quietly during the procedure. They were asked to have their palm faced upward where the cuff can be adjusted at approximately 2-3 cm above the elbow. The cuff's air tube was adjusted so that it lies over the brachial artery on the inside of the arm. The cuff was tightened so that the index arrowhead falls within the "PROPER FIT RANGE", which indicated that the cuff was suitable for the participant. Once the cuff was adjusted, BP and HR data was collected. The systolic, diastolic, and heart rate data were displayed on the screen of the monitor and were recorded.

Academic Assessment

Journal Activities. To measure one aspect of children's academic abilities, participants were asked to complete journal entries during weeks 1, 3, 5, and 7. The journal entries assessed children's writing abilities in Language Arts. Language Arts is taught across Ontario elementary schools and is outlined in the Ontario curriculum. The journals contained questions that were narrative in nature. An example of a question is, "Write a story on how you spent a day at a Canada Day Carnival. What kinds of activities did you do at this carnival? Who were you with? What did you see or hear?" A rubric, developed by a qualified teacher and based on the Ministry of Education Ontario Curriculum, was used as a guideline to assess participants' academic levels. There are two different versions of the rubric – one developed specifically for students from grades 2 to 4 (see Appendix F) and another rubric for students from grades 7 to 8 (see Appendix G). Participants received a maximum level of 4, which indicates the highest academic achievement.

Two Ontario certified teachers graded the journals and were blind to the conditions (i.e. Mindful Me!, control). An average of the two grades provided from the teachers indicated the final grade a participant received for a journal entry.

Procedure

Prior to implementing the programs, participants were asked to complete a number of measures to collect baseline data for EF and emotional regulation. Measures for EF included the Stroop Task, the Digit Spa subtest, and the DCCS task. Additionally, parents were asked to complete the BRIEF. Measures for emotional regulation included the MASQ – AA, CRSQ – RSR, and the RI. Children's mindful attention was also assessed at baseline using the MAAS – C.

The study used stratified random sampling to assign children to the conditions (i.e. Mindful Me!, control). There were three schools involved in the current study and a total of 98 children who participated. Since the study was interested in exploring the differences between younger and older children, the study used age group (i.e. younger, older) as the chosen stratification. Accordingly, the sample was divided into 51 younger (7-10 years) and 47 older (12-13 years) children. Each age group was then divided further into the Mindful Me! condition or the Social Skills condition. Each condition contained an equal number of males and females and each condition contained an equal number of students from grades 2 to 4 and grades 7 to 8. This was done to improve representation of gender and grades within the sample and to ensure that the strata were not over-represented. Therefore, random assignment of equal numbers of males and females and grades were made to each condition. Microsoft Excel was used for the randomization procedures.

At the first session, 8-10 children were invited to participate in either the Mindful Me! or Social Skills program. A research associate first explained to participants that she had some special activities. She asked them if they would like to go with her to a room chosen by school staff. If participants agreed, they were escorted to the chosen area. If they did not agree, they were thanked anyway and told they could return to their seat. This happened at every session.

Mindful Me! Program. The Mindful Me! program was administered to children for the current study. The Mindful Me! program was adapted from pre-existing mindfulness-based programs currently being used in schools. For example, the MindUp Curriculum is a mainstream mindfulness-based program that is currently being used in about 400 schools worldwide (The Hawn Foundation, 2011). MindUp is an effective social and emotional learning program that promotes academic success, with empirical evidence in support of its effectiveness. For example, Schonert-Reichl et al. (2015), conducted a study of 99 fourth and fifth grade classes that participated in the MindUp Curriculum. This study included self-report assessments of well-being, mindful attention, social and emotional competencies, school self-concept, and awareness. Results of the study revealed that students who participated in the MindUp Curriculum displayed enhancements in cognitive and emotional control, reduced stress and depressive symptoms, promoted well-being and social skills, facilitated pro-social goals, increased empathy, perspective taking, and mindful attention, and produced positive school outcomes. Further research can be found on the MindUp website (https://mindup.org/mindup-is-effective/).

Accordingly, the Mindful Me! program was adapted from pre-existing mindfulness-based programs and websites/blogs that have outlined mindfulness activities. For instance, the MindUp Curriculum focuses on training students' focused awareness, practicing to enhance awareness (mindful seeing, mindful smelling), social and emotional understanding, and gratitude. MindUp consists of 12 lessons taught once a week with each lesson lasting approximately 40-50 min. The lessons, which are taught primarily by teachers, are centered around social and emotional literacy (e.g. expressing with gratitude), neuroscience (e.g. mindful awareness, focused awareness), positive psychology (e.g. optimism, appreciating happy experiences), and mindful awareness (e.g. mindful listening, mindful tasting). The MindUp Curriculum contains the core mindfulness practice of focusing on one's breathing and bodily sensations. The Mindful Me! program similarly focuses on facilitating the development of children's socio-emotional competence and resilience through a series of lessons where children learn and practice "mindful attention awareness." The Mindful Me! program incorporates 8 core mindfulness components including *relaxation/breathing, body scan, mindful movements, self-compassion, worry, mindful listening, mindful eating, and gratitude*.

For the current study, participants were only allotted 30 minutes to participate in the sessions. The MindUp program had to be modified in order to allow participants to engage in the activities for only 30 minutes. Additionally, the MindUp program consists of lessons and activities that are largely intended for teachers to incorporate within their curriculum. For the purpose of this study, there was no substantial emphasis on the lessons, as they are meant for curriculum teaching and were too long. In order to allow participants to engage in the activities for the current study, the Mindful Me! sessions contained shorter informal lessons and shorter timed activities.

An unpublished undergraduate thesis first implemented the Mindful Me! program for 43 children in grades 3 to 6 (Wach, 2015). This thesis focused on the effectiveness of the Mindful Me! program on children's emotional regulation and executive function. For emotional regulation, this study assessed children's self-reported emotional states by asking children to rate how they feel on an emotional scale (e.g. angry, sad, anxious, calm, happy, hyper) from before engaging in the mindfulness activities to after completing the mindfulness activities. There were no effects reported for children's emotional regulation from this study. This study similarly administered the BRIEF for parents before and after the Mindful Me! program (8 weeks) to assess levels of executive function. The study analyzed mean differential scores, which indicated an average decrease in subscale scores of 2.95 (SD = 7.92), an average decrease in index scores of 3.5 (SD = 7.08), and no change in the overall global executive composite. However, there were only 5 BRIEFS returned from parents, meaning only 5 pre- and post-test BRIEFS were compared. As a result, the current study also utilized the BRIEF in the hopes of extending the results from the previous study, since the sample size was much larger in this current study. The current study also extended measures of emotional regulation and executive function by including more emotional regulation scales and executive function tasks (as indexed by inhibition, working memory, and cognitive flexibility). The current study further added stress and academic variables to add to existing literature. Although the Mindful Me! program has previously been implemented in schools (e.g. Wach, 2005), there is not yet any empirical evidence of its effectiveness. Furthermore, the previous study did not compare the outcomes from the Mindful Me! condition to an active control condition. This study was the first to investigate whether the Mindful Me! program had any effects on children's executive function, emotional regulation, stress, and academic performance in comparison to an active control condition.

Mindful Me! Program Sessions. For 8 weeks, children participated in small groups of 8 to 10 with 1 to 2 research associates for 30 minutes. Children stayed within the same assigned groups for all of the sessions. The Mindful Me! program was comprised of breathing practices, learning how to stay in the present moment, and various activities selected as tools for children to learn how to accept and manage their emotions and subsequent behaviour. There were eight different themes presented each week, which included relaxation, mindful movements, self-compassion or 'letting go of anger', gratitude or thankfulness, mindful listening, worry, mindful eating, and a Spider Man activity, aimed at focusing on the body and the senses (see Table 2). For example, for the week of 'letting go of anger', each child was given a jar containing water and a pebble. Children were asked to think of a time when they were angry. The research associates reminded the children to be mindfully aware of their experiences and bodily sensations at the time they felt angry. For example, children were asked whether their body felt tense, whether they were breathing heavily, if their fists were clenching, or if their foreheads wrinkled with frustration. After, children were told to quietly drop the pebble into the jar. As the pebble dropped, children were encouraged to visualize their anger getting further and further away, becoming less and less important. As the pebble settled to the bottom of the jar, children were told to let their anger settle in their heads and in their hearts. If time permitted, children were allowed to drop another pebble and go through the same process.

For children in the Mindful Me! program, they were trained to do breathing techniques before every activity, where they were instructed to slowly breathe in through their nose, hold it for 3 seconds, and slowly exhale through their mouth. They were asked to repeat this technique before every activity three times. At every session, participants were always reminded to focus on the present moment.

Social Skills Program. The present study also implemented a control condition, a Social Skills program, to compare to the Mindful Me! program. The activities that were incorporated in the Social Skills program was acquired from an adapted social and emotional learning (SEL) program called Partners in Promoting Learning (PIPL) (Savage, Wood, Gottardo, & Piquette, 2017). The study by Savage et al. (2017) is currently part of a five-year longitudinal study evaluating the effectiveness of PIPL compared to two other reading interventions designed to enhance reading ability in young children from kindergarten to grade 3. PIPL was designed from other evidence based SEL programs. SEL functions as an umbrella term for various types of socio-emotional interventions that are implemented in various schools aimed at bullying prevention, conflict resolution, and social skills training (Wood, 2015). There is evidence to support the effectiveness of SEL in helping children in school readiness, number skills, language, literacy, and social-emotional development (Shonkoff & Phillips, 2000; Denham, 2006). For example, Durlak, Weissberg, Dymnicki, Taylor, and Schellinger (2011) conducted a meta-analysis of findings for the Collaborative for Academic Social and Emotional Learning (CASEL) program that was implemented across schools. The findings demonstrated that students (K-12) who were exposed to this SEL program displayed increases in academic performance, social skills and attitudes, and positive behaviours compared to students who did not receive the intervention.

PIPL adapted its own activities from Lauren Shapiro's book, *101 Ways to Teach Children Social Skills: A Ready to Use Reproducible Activity Book*, designed to teach children social and emotional skills. PIPL represents the three core domains of SEL skills, which includes emotional processes, social/interpersonal skills, and cognitive regulation. The three domains have been associated with academic performance (Durlak et al., 2011), behaviour modification and emotional health and well-being (Payton et al., 2008). The current study addressed only the domain of social/interpersonal skills for the Social Skills program, which is aimed at recognizing and understanding social cues, interacting with peers, interpreting others' behaviours, navigating social situations, and other prosocial behaviours (Wood, 2015). Therefore, the Social Skills program incorporates 6 social skills components including *expressive communication, nonverbal communication, expressing one's feelings, caring about oneself and others, listening, and being part of a team*. Lessons and activities were similarly modified to fit the allotted 30 minutes per session.

Social Skills Sessions. For 8 weeks, participants who were randomly selected to participate in the Social Skills program were also placed in smalls groups of 8 to 10 with 1 to 2 research associates for 30 minutes. Similarly, children stayed within the same assigned groups for all of the sessions. The Social Skills group was comprised of activities related to social issues, peer relationships, and encouraging prosocial behaviours. There were eight different themes or activities presented each week, including snowball charades, 'make a wish', kindness, 'in the shoes of another' or empathy, 'what does a good citizen do', introduction to values, the 'kindness tree', and team work (see Table 3). For example, for the week of kindness, children were paired up with a peer and provided each other a compliment. Children were asked to write a compliment for their peer on a 'Certificate of Awesomeness' and were then asked to give this certificate to their peer. The activity for week 8, which focused on team work, was modified for children in grades 7 and 8 because the activity presented for children in grades 2 to 4 was not suitable children in grades 7 and 8. The modified version for children in grades 7 and 8 also captured the theme of team work. The Social Skills program does not include children performing breathing techniques or any other mindfulness training before any of the activities presented. Children were never taught lessons on how to stay in the present moment or to shift their focus to the present moment.

For weeks 1, 3, 5, and 7, children were asked to complete the journal writing activities. Research associates also collected blood pressure and heart rate data during weeks 2, 6, and 8. Blood pressure and heart rate procedures occurred before and after the sessions for both conditions. After 8 weeks, children were asked to complete the same measures that were initially completed at baseline, which were the Starfish Task, DCCS task, Digit Span test, MASQ – AA, CRSQ – RSR, RI, and MAAS – C. Parents were once again asked to complete the BRIEF.

Once the data were analyzed, and before the end of the school year, a letter was provided to parents and to the school principals outlining the aims of the study and a brief review of results and feedback.

Results

Data Analytic Plan

The dataset was first cleaned to reduce the small number of missing values. Missing values were reported for the MAAS – C, MASQ – AA, CRSQ – RSR, and Stroop task (accuracy and response cost). In this study, each of the scales mentioned above had less than 5% missing values (no response to an item in the scale). The missing values were replaced by the series mean. For example, if a participant had a missing score for an item on a questionnaire, the mean would have been calculated from all the other participants and then the resulting mean would be placed in the participant's missing score.

Preliminary analyses were conducted to compare baseline scores of the participants. Participants were randomly assigned to the conditions to maximize the possibility that individual differences in the sample would not skew results. To be conservative however, a 2 (condition: Mindful Me!, control) x 2 (gender: male, female) analysis of variance was conducted to compare the baseline scores between the two conditions (Mindful Me!, control) and the two genders (male, female). Gender was considered in the preliminary analyses to assess whether differences existed between the two genders. Future research should place an emphasis on considering gender difference as a factor in the analyses of mindfulness on children, especially if substantial differences are noted in this study. It is posited that genders may respond differently to the mindfulness intervention. However, for the current study, gender was not hypothesized and will not be explored in detail. Independent samples *t* tests were conducted post hoc to assess interaction effects.

In the main analyses, repeated – measures analyses of variance were conducted to assess each of the variables under study, including EF (WISC-IV, stroop task, DCCS, BRIFS), emotional regulation (MAAS-C, MASQ, CRSQ – RSR, RI), physiological stress (blood pressure, heart rate), and academic performance (journal grades). The first hypothesis proposed was that children from the Mindful Me! condition would acquire higher scores from pre- to post-test time points in measures of EF compared to children from the control condition. The second hypothesis proposed was that children from the Mindful Me! condition would gain higher competence in emotional regulation skills from pre- to post-test time points compared to children from the control condition. The third hypothesis proposed was that children from the Mindful Me! condition would have decreased levels of stress, as indicated by lower blood pressure and heart rate levels, from before the Mindful Me! session to after the session, compared to children from the control condition. Lastly, the fourth hypothesis stated that children from the Mindful Me! condition would obtain higher grades on their journal writing activities compared to children from the control condition. This study also had a novel exploratory component in assessing age group differences between younger (ages 7-10) and older children (ages 12-13). Accordingly, all four hypotheses considered age group differences in response to the mindfulness program.

Each analysis used condition (two levels: Mindful Me!, control) and age group (two levels: younger, older) as the between-subjects variable and time (two levels: pre-test, post-test) as the within-subject variable. The first three hypotheses investigated group by time interactions to assess whether there were differences between the two conditions and scores on the measures from pre- to post-test. Further, all four of the hypotheses investigated group by time by age group interactions to explore whether there were age group differences in addition to condition differences and scores from pre- to post-test. Post hoc *t* tests were conducted when the ANOVAs revealed significant interaction effects. When there were no interactions produced from the ANOVAs, further planned *t* tests were conducted to assess condition differences and to address the exploratory component. The planned *t* tests were set at an alpha level of .03. For measures that were assessed at both pre and post, within-group pre-post effect sizes (Cohen's *d*) were computed.

Preliminary Analyses

To establish baseline equivalence, a 2 (condition: Mindful Me!, control) x 2 (gender: male, female) analysis of variance was computed to assess statistical differences on pre-test measures between the two conditions (Mindful Me!, control) and the two genders (male, female).

First, condition (Mindful Me!, control) differences were analyzed to assess statistical differences on pre-test measures between conditions. There were no significant condition differences in the completion sample found at pre-test for the WISC – IV, for Stroop task, DCCS task, BRIEF, MAAS – C, MASQ – AA, RI, CRSQ – RSR, and for journal grade at week 1. There was a significant main effect found for blood pressure on week 2, specifically for heart rate, $F(1, 68) = 5.255$, $p = .025$, $\eta_p^2 = .072$. The Mindful Me! condition had significantly higher heart rate levels on week 2 at baseline ($M = 82.28$, $SD = 17.540$) compared to the control condition ($M = 73.45$, $SD = 12.480$). Condition differences will be addressed in the main analysis for heart rate on week 2.

Second, gender (male, female) differences were analyzed to assess statistical differences on pre-test measures. There were no significant main effects found for measures including the MAAS – C, MASQ – AA, RI, CRSQ – RSR, the stroop task, DCCS task, the BRIEF, and for blood pressure for week 2. There were significant main effects reported for the digit span test, specifically in the forward portion of the test. There was also a main effect reported for week 1 of the journal writing entries. First, there was a main effect for gender found for the forward portion of the WISC – IV digit span test, which includes LDSF (length of sequence forward) and DSF (total trials correct). There was a significant main effect reported for LDSF, $F(1, 77) = 6.385$, $p = .014$, $\eta_p^2 = .077$. For LDSF, males scored significantly higher at pre-test ($M = 6.42$, *SD* = 1.538) relative to females (*M* = 5.67, *SD* = 1.243). There was also a significant main effect found for DSF, $F(1, 77) = 5.872$, $p = .018$, $\eta_p^2 = .071$. For DSF, males also scored significantly higher at pre-test (*M* = 9.69, *SD* = 2.713) relative to females (*M* = 8.44, *SD* = 2.106). There was also a significant main effect for journal grades at week 1, $F(1, 77) = 11.358$, $p = .001$, $\eta_p^2 = .129$. Females had a significantly higher mean grade at pre-test (*M* = 3.38, *SD* = .519) relative to males (*M* = 2.87, *SD* = .835). Gender differences will be addressed in the main analysis for the forward portion of the digit span test and for the journal writing entries.

Main Analyses

Mindful Attention Awareness Scale for Children (MAAS – C). The main analyses first began with the assessment of mindful attention as assessed by the MAAS – C. The scores from the MAAS – C indicated whether participants from either the Mindful Me! or control condition had obtained higher or lower levels of mindful attention from pre- to post-test. However, it was expected that children from the Mindful Me! condition would have higher scores from pre- to post-test as a result of the mindfulness intervention relative to children from the active control condition. An outlier was reported for an older participant from the control condition, therefore their score was excluded from this analysis. Group means and *SD*s for the MAAS – C are reported in Table 6.

A repeated measures ANOVA revealed a main effect for age group (younger, older), $F(1, 93) = 23.197$, $p < .001$, $\eta_p^2 = .200$. The younger participants had a higher mean score (*M* = 69.928, *SD* = 1.435) relative to the older participants (*M* = 59.913, *SD* = 1.505), indicating a higher level of mindful attention for the younger participants.

The ANOVA further revealed a significant condition (Mindful Me!, control) by age group (younger, older) interaction, $F(1, 93) = 6.293$, $p = .014$, $\eta_p^2 = .063$. Independent samples *t* tests were conducted to further assess differences between the conditions and age groups at pre-test and at post-test. The independent samples *t* tests revealed a significant difference between the younger and older participants in the control condition at pre-test. The younger participants had significantly higher scores at pre-test ($M = 67.85$, $SD = 9.646$) relative to the older participants ($M = 60.40$, $SD = 10.530$), $t(43) = 2.477$, $p = .017$. There were no differences found between the younger and older participants in the control condition at post-test. Similarly, independent samples *t* tests revealed a significant difference between the younger and older participants from the Mindful Me! condition. The younger participants had significantly higher scores at pre-test ($M = 72.37$, $SD = 11.255$) relative to the older participants ($M = 57.25$, $SD = 10.820$), $t(50) = 4.917$, $p < .001$. There was also a significant difference between the younger and older participants in the Mindful Me! condition at post-test. The younger participants had significantly higher scores at post-test ($M = 74.07$, $SD = 12.593$) relative to the older participants ($M = 58.73$, $SD = 11.825$), $t(50) = 4.503$, $p < .001$.

Independent samples *t* tests were also conducted to assess differences within the older children between the conditions and also to assess differences within the younger children between the conditions at pre-test and at post-test. There was no significant difference found within the younger participants between the Mindful Me! and control conditions at pre-test ($p > .05$). However, there was a significant difference found within the younger participants at post-test, $t(49) = -1.520$, $p = .034$. The younger participants from the control condition had significantly lower scores ($M = 65.42$, $SD = 15.789$) relative to the younger participants from the Mindful Me! condition ($M = 74.07$, $SD = 12.593$). There were no significant differences found within the older participants between conditions at pre-test and at post-test (*p*s > .05).

Overall, the analyses for the MAAS – C did not reveal any results consistent with previous literature. There were no significant findings reported for younger or older participants from either the Mindful Me! or the active control condition for mindful attention.

Hypothesis 1: Improvements in Executive Function. The first hypothesis proposed was that children from the Mindful Me! condition were expected to improve in EF skills compared to children from the control condition, as indicated in previous literature. EF was measured by the WISC – IV Digit Span subtest, which includes the forward and backward portion, the Stroop task, which includes accuracy and response cost, the DCCS task, and the BRIEF. Pre- and post-test scores for each variable were compared using a repeated – measures analysis of variance. The analyses used a 2(condition: Mindful Me!, control) x 2(age group: younger, older) x 2(time: pre-test, post-test) design, with condition and age group as the between-subject variables and time as the within-subject variable. Post hoc *t* tests were computed to address significant interactions produced by the ANOVA. Further, planned *t* tests were conducted to address the exploratory component of age group differences. The analyses for the assessment of EF will begin with the WISC – IV.

WISC – IV Digit Span subtest. The digit span subtest includes the forward and backward portion. The mean scores and *SD*s reported in Table 4 are calculated based on the lengthiest sequence reached by age group (younger, older) and condition (Mindful Me!, control) for the forward portion (LDSF) and the backward portion (LDSB). Mean scores and *SD*s are also reported for the number of trials correct by age group and condition for the forward portion (DSF) and backward portion (DSB). Higher mean scores indicate higher levels of working memory. No outliers were found for the Digit Span subtest analyses.

Forward portion – LDSF. A repeated – measures ANOVA was conducted to assess main effects for LDSF (length of sequence forward). LDSF was based on the number of digits participants were able to recall in the forward portion. The maximum score they can receive is a 9. The ANOVA revealed a main effect for age group (younger, older) on LDSF, $F(1, 94) = 9.256$, $p = .003$, $\eta_p^2 = .090$. Younger participants had a lower mean score ($M = 5.709$, $SD = .140$) relative to the older participants ($M = 6.324$, $SD = .146$). Further, the ANOVA revealed a significant time (pre-test, post-test) by age group interaction for LDSF, $F(1, 94) = 12.049$, $p = .001$, $\eta_p^2 = .114$. Post hoc paired samples *t* tests revealed that younger participants had a significant increase in mean scores from pre- ($M = 5.49$, $SD = 1.046$) to post-test ($M = 5.92$, $SD = .997$) for LDSF, $t(50) = -2.558$, $p = .014$, $d = .42$. Older participants had a significant mean decrease from pre- ($M = 6.55$, $SD = 1.457$) to post-test ($M = 6.11$, $SD = 1.184$) for LDSF, $t(46) = 2.455$, $p = .014$, $d = .33$.

Planned paired samples *t* tests were conducted to address the exploratory component. The planned tests revealed a significant pre-post change with medium effect sizes for younger and older participants who participated only in the Mindful Me! condition for LDSF. Mean scores for younger participants in both conditions increased from pre- to post-test (*M*s and *SD*s reported in Table 4). However, it was revealed that only the younger participants from the Mindful Me! condition had a significant increase in scores in LDSF from pre- to post-test, $t(27) = -3.151$, $p = .004$, $d = .55$. There was no significant increase found for the younger participants from the control condition for LDSF, $t(22) = -.861$, $p = .398$, $d = .25$. This indicates that younger children from the Mindful Me! condition had significantly increased their scores from pre- to post-test in LDSF compared to the younger children from the control condition. For the older participants, their mean scores decreased from pre- to post-test for both the Mindful Me! and control conditions (*M*s and *SD*s reported in Table 4). However, it was only the older participants from the Mindful Me! condition who had a significant decrease in scores in LDSF from pre- to post-test, $t(23) = 3.473$, $p = .002$, $d = .60$. No significant decrease was reported for older participants from the control condition, $t(22) = .581$, $p = .567$, $d = .12$.

Gender differences were addressed from the preliminary analysis for LDSF, where males scored significantly higher at pre-test compared to females. A 2(condition: Mindful Me!, control) x 2(age group: younger, older) x 2(time: pre-test, post-test) x 2(gender: male, female) repeated – measures ANOVA was conducted to further analyze gender effects. The ANOVA revealed a time by gender interaction, $F(1, 90) = 10.336$, $p = .002$, $\eta_p^2 = .103$. Further post hoc analyses revealed that females scored significantly higher from pre- ($M = 5.65$, $SD = 1.234$) to post-test ($M = 6.06$, $SD = 1.088$), $t(48) = -2.517$, $p = .015$, $d = .35$. For males, they scored significantly lower from pre- ($M = 6.35$, $SD = 1.408$) to post-test ($M = 5.96$, $SD = 1.098$), $t(48) = 2.032$, $p = .048$, $d = .31$. Future studies may have to consider gender differences in response to the mindfulness intervention.

Forward portion - DSF. A repeated – measures ANOVA was conducted to assess main effects for DSF (trials correct forward). DSF was based on the number of trials participants were able to correctly recall in the forward portion. The maximum score they can receive is 16. The ANOVA revealed a significant main effect for age group (younger, older), $F(1, 94) = 11.346$, $p < .001$, $\eta_p^2 = .108$. The younger participants had a lower mean score ($M = 8.345$, $SD = .249$) relative to the older participants ($M = 9.554$, $SD = .258$).

The ANOVA further revealed a significant time (pre-test, post-test) by age group interaction, $F(1, 94) = 17.338$, $p < .001$, $\eta_p^2 = .156$. Post hoc paired samples *t* tests revealed significant differences between the younger and the older children. Younger participants had a significant increase in scores for DSF from pre- (*M* = 8.02, *SD* = 1.749) to post-test (*M* = 8.67, *SD* = 1.583), *t*(50) = -2.570, *p* = .013, *d* = .39. For older children, there was a significant decrease in scores on DSF from pre- (*M* = 10.02, *SD* = 2.532) to post-test (*M* = 9.11, *SD* = 2.056), *t*(46) = 3.388, *p* = .001, *d* = .39.

Finally, the ANOVA revealed a significant 3-way time (pre-test, post-test) by condition (Mindful Me!, control) by age group (younger, older) interaction, *F*(1, 94) = 4.093, *p* = .046, η_p^2 = .042. Post hoc paired samples *t* tests revealed a significant pre-post effect with medium effect sizes for the younger and older participants from the Mindful Me! condition for DSF. For younger participants from the Mindful Me! condition, there was a significant increase from pre- to post-test for DSF, *t*(27) = -3.416 , *p* = .002 , *d* = .54 (*M*s and *SD*s reported in Table 4). For younger participants from the control condition, there was a nonsignificant increase from pre- to post-test for DSF, *t*(22) = -.682 , *p* = .503 , *d* = .19 (*M*s and *SD*s reported in Table 4). This indicates that the younger participants from the Mindful Me! condition obtained significantly higher scores on DSF from pre- to post-test, compared to younger participants from the control condition. For the older participants, their mean scores decreased from pre- to post-test in both the Mindful Me! and control conditions (*M*s and *SD*s reported in Table 4). However, the older participants from the Mindful Me! condition had a significant decrease in mean scores from pre- to post-test for DSF, *t*(23) = 4.372 , *p* < .001, *d* = .62 and no significant decrease was reported for the older participants from the control condition for DSF, *t*(22) = 1.088 , *p* = .288, *d* = .20.

Gender differences were addressed from the preliminary analysis for DSF, where males scored significantly higher at pre-test compared to females. A 2(condition: Mindful Me!, control) x 2(age group: younger, older) x 2(time: pre-test, post-test) x 2(gender: male, female) repeated – measures ANOVA was conducted to analyze gender effects. The ANOVA revealed a time by gender interaction, $F(1, 90) = 13.482$, $p < .001$, $\eta_p^2 = .130$., as with the LDSF scores. Further post hoc test revealed that females scored significantly higher from pre- ($M = 8.45$, $SD = 2.082$) to post-test ($M = 9.02$, $SD = 1.843$), $t(48) = -2.342$, $p = .023$, $d = .29$. For males, they scored significantly lower from pre- ($M = 9.51$, $SD = 2.542$) to post-test ($M = 8.73$, $SD = 1.823$), $t(48) = 2.697$, $p = .010$, $d = .35$. Future studies may have to consider gender differences in response to the mindfulness intervention.

Overall, for the forward portion of the WISC – IV, it was revealed that only younger children from the Mindful Me! condition scored significantly higher from pre- to post-test. This is an indication that younger children from the Mindful Me! condition were better able to recall more numbers from pre- to post-test, compared to the younger children from the control condition. Additionally, the younger children from the Mindful Me! condition were able to recall more trials correctly than the younger children from the control condition. For the older children, both participants from the Mindful Me! and control conditions reported decreases in scores for the forward portion. However, the analysis revealed a significant decrease in scores only for the older children from the Mindful Me! condition.

Backward portion - LDSB. A repeated – measures ANOVA was conducted to assess main effects for LDSB (length of sequence backward). LDSB was based on the number of digits participants were able to recall in the backward portion. The maximum score they can receive is an 8. The ANOVA indicated no significant main effects or interactions for LDSB (length of sequence backward) (*p*s > .05).

Backward portion - DSB. A repeated – measures ANOVA was conducted to assess main effects for DSB (trials correct backward). DSB was based on the number of digits participants were able to recall in the backward portion. The maximum score they can receive is a 16. The

ANOVA indicated a main effect for time (pre-test, post-test) for DSB, $F(1, 94) = 7.779$, $p = .006$, $\eta_p^2 = .076$. Participants in general had a significant increase from pre- ($M = 6.61$, $SD = 1.476$) to post-test ($M = 7.03$, $SD = 1.646$) for DSB. There was also a main effect of age group (younger, older) reported in the ANOVA analysis, $F(1, 94) = 4.382$, $p = .039$, $\eta_p^2 = .045$. Younger participants had a lower mean score ($M = 6.549$, $SD = .1936$) relative to the older participants ($M = 7.130$, $SD = .200$). There were no further main effects or interactions found from the ANOVA.

Overall, there were no findings reported for LDSB and DSB between age groups and between conditions. There were no additional findings found for the backward portion of the digit span test.

Stroop Task. The stroop task includes measures of accuracy and response cost. Accuracy was measured by the number of correct trials participants received for incongruent and congruent trials. The maximum score participants can receive is a 40. For response cost, incorrect trials were not included in the calculation of average reaction times because participants were not successfully inhibiting their behavioural responses on these trials. To deal with data that were outliers (low and high reaction times), previous literature has conducted varying procedures, such as calculating the median reaction time, excluding reaction times that were over 2000 ms and lower than 300 ms, and excluding reaction times under 300 ms and reaction times larger than three *SD*s from the participant's mean (e.g. Ambrosi, Lemaire, & Blaye, 2016; Boelens & La Heij, 2017; Wright, 2016). For this study, reaction times less than 100 ms were considered premature, and were not included. For the current study, reaction times over 1000 ms were excluded because the participants were presumably distracted. The remaining reaction times were used to compute an average response time for congruent and incongruent trials for each participant. Scores were then computed by subtracting their average reaction times on congruent trials from their average reaction times on incongruent trails, yielding a score that represented the response cost associated with inhibition corrected for general reaction time (termed the "Simon Effect" in previous literature; e.g., Martin-Rhee & Bialystok, 2008).

Group means and *SD*s for stroop task accuracy and response cost are reported in Table 4. An outlier was reported from a younger participant from the Mindful Me! condition during pre-test for accuracy, 2 outliers were reported from younger participants from the control condition for accuracy, and 1 outlier was reported from a younger participant from the Mindful Me! condition for response cost, therefore their data was excluded from the analyses. The analyses for accuracy and response cost used a 2(condition: Mindful Me!, control) x 2(age group: younger, older) x 2(time: pre-test, post-test) design, with condition and age group as the between-subject variables and time as the within-subject variable. Post hoc *t* tests were conducted to assess significant interactions. Further planned *t* tests were conducted to address age group differences as the exploratory component for both accuracy and response cost.

Accuracy. A repeated – measures ANOVA was conducted to assess main effects for accuracy. The ANOVA revealed a significant time (pre-test, post-test) by age group (younger, older) interaction, $F(1, 93) = 7.436$, $p = .008$, $\eta_p^2 = .074$. Post hoc paired samples *t* tests revealed that in general, older participants' mean score significantly decreased from pre- ($M = 37.83$, $SD = 1.167$) to post-test ($M = 35.85$, $SD = 5.864$), $t(46) = 2.230$, $p = .031$, $d = .47$. For the younger participants, their mean scores increased from pre- ($M = 36.96$, $SD = 1.989$) to post-test ($M = 37.54$, $SD = 1.681$), however, this increase was significant only at a 1-tailed level, $t(49) = -.1787$, $p = .080$, $d = .31$. There were no additional main effects or interactions found in the ANOVA analysis.

Planned paired samples *t* tests were conducted to address the exploratory component. The planned tests revealed a significant pre-post decrease with small effects sizes for the older participants from the Mindful Me! condition, $t(23) = 2.375$, $p = .026$, $d = .23$, relative to the older participants from the control condition, $t(22) = 2.254$, $p = .035$, $d = .13$. This indicates that mean scores significantly decreased from pre- to post-test for the older participants from the Mindful Me! condition (*M*s and *SD*s reported in Table 4). Mean scores for the younger participants in both conditions increased from pre- to post-test (*M*s and *SD*s reported in Table 4). However, no significant increases were found for the younger participants from the Mindful Me! or control condition, $t(26) = -1.586$, $p = .125$, $d = .39$, $t(22) = -.930$, $p = .362$, $d = .32$, respectively.

Response cost. A repeated – measures ANOVA revealed no significant main effects or interactions for response cost (p's $> .05$).

Overall, there were no significant effects reported for the younger participants from either the Mindful Me! or the control condition on accuracy or response cost. In contrast, significant decreased scores were reported for the older participants from the Mindful Me! condition on accuracy. In conclusion, the analyses for the stroop task for accuracy and response cost revealed no consistent results that aligns with hypothesis 1.

Dimensional Change Card Sort (DCCS) task. The first two phases (preswitch, postswitch) of the DCCS task were excluded from this analysis as participants performed well on both phases. The scores for the border phase were calculated based on the number of correct trials participants achieved. The maximum score participants can receive is a 12. Group means and *SD*s are reported in Table 4 for all age groups (younger, older) and conditions (Mindful Me!, control). One outlier was found from a younger participant from the control group, therefore their data was excluded from the border phase analyses. The analyses for the border phase used a

2(condition: Mindful Me!, control) x 2(age group: younger, older) x 2(time: pre-test, post-test) design, with condition and age group as the between-subject variables and time as the within-subject variable. Further post hoc *t* tests were conducted to assess significant interactions.

*Border phase***.** A repeated – measures ANOVA revealed a significant main effect for time, a main effect for age group, and a time (pre-test, post-test) by condition (Mindful Me!, control) by age group (younger, older) 3-way interaction. The main effect for time will first be discussed, followed by the main effect for age group, and then finally the 3-way interaction.

First, the ANOVA revealed a main effect for time, $F(1, 93) = 7.137$, $p = .009$, $\eta_p^2 = .071$. Participants had significantly increased scores from pre- ($M = 10.11$, $SD = 1.814$) to post-test ($M = 10.63$, $SD = 1.543$). This indicated that in general, participants obtained higher scores from pre- to post-test on the border phase of the DCCS task. Second, the ANOVA revealed a main effect for age group, $F(1, 93) = 12.180$, $p = .001$, $\eta_p^2 = .116$. Younger participants had a lower mean score ($M = 9.908$, $SD = .192$) relative to the older participants ($M = 10.870$, $SD = .197$).

Third, the ANOVA revealed a time (pre-test, post-test) by condition (Mindful Me!, control) by age group (younger, older) interaction, $F(1, 93) = 4.284$, $p = .041$, $\eta_p^2 = .044$. Further post hoc paired samples *t* tests were conducted to assess this 3-way interaction. The *t* test reported significant pre-post change with medium effect size for only the younger participants from the Mindful Me! condition. Younger participants from both the Mindful Me! and control conditions had an increase in mean scores from pre- to post-test (*M*s and *SD*s reported in Table 4). However, there was a significant increase and larger effect size reported only for the younger participants from the Mindful Me! condition, $t(27) = -2.863$, $p = .008$, $d = .61$ compared to the younger participants from the control condition, $t(21) = -.339$, $p = .738$, $d = .08$. This means that younger children from the Mindful Me! condition had obtained significantly higher scores on the border phase compared to the younger children from the control condition. Mean scores also increased for the older participants from both conditions (*M*s and *SD*s reported in Table 4), however, no significant increases were found for the older participants from either the Mindful Me! or control condition, $t(23) = -.245$, $p = .809$, $d = .06$, $t(22) = -2.006$, $p = .057$, $d = .09$, respectively.

Overall, the analyses for the border phase of the DCCS task revealed that only younger children from the Mindful Me! condition obtained significantly higher scores from pre- to post-test compared to the younger children from the control condition. Consistent with results from working memory, the analyses for the DCCS task revealed that younger children from the Mindful Me! condition were able to enhance their cognitive flexibility, as indicated by higher scores from pre- to post. However, no significant effects were reported for the older children from either the Mindful Me! or control condition.

Behaviour Rating Inventory of Executive Function (BRIEF) for parents. The BRIEF includes 12 scales, including Inhibit, Shift, Emotional Control, Initiate, Working Memory, Plan/Organize, Organization of Materials, Monitor, Behavioural Regulation (BRI), Metacognition (MI), and Global Executive Composite (GEC). To assess their scores on the scales, post-test mean scores were subtracted from pre-test mean scores to calculate mean differential scores for each of the scales under study. Mean differentials are displayed in Table 5 to summarize pre- and post-test differences. Negative integers represent a decrease in BRIEF score, meaning an increase in executive function. Positive integers represent an increase in BRIEF score, indicating a higher level of executive dysfunction.

Pre- and post-test scores were compared using a repeated – measures analysis of variance for each of the 12 scales from the BRIEF. The analyses used a 2(condition: Mindful Me!, control) x 2(age group: younger, older) x 2(time: pre-test, post-test) design, with condition and age group as the between-subject variables and time as the within-subject variable. Post hoc *t* tests were conducted to assess significant interactions. Further planned *t* tests were conducted to address the exploratory component.

The following scales, Inhibit, Shift, Emotional Control, Initiate, Organization of Materials, and Behavioural Regulation are reported in the resulting analysis of the BRIEF as the ANOVA's revealed a main effect or a significant interaction for these scales. No further effects were reported for the younger or older participants from either the Mindful Me! or control conditions for any other scale assessed from the BRIEF while conducting post hoc analyses ($ps > .05$). No outliers were reported. The analyses for the assessment of the BRIEF will begin with Inhibit.

Inhibit. A repeated – measures ANOVA revealed a significant a main effect for age group (younger, older), $F(1, 37) = 6.072$, $p = .019$, $\eta_p^2 = .141$. The younger participants had a higher mean score ($M = 54.372$, $SD = 2.195$) relative to the older participants ($M = 46.979$, $SD = 2.045$), indicating a higher level of Inhibit dysfunction for the younger participants. No further significant main effects or interactions were reported for Inhibit as a result of the ANOVA analysis.

Shift. A repeated – measures ANOVA revealed a significant time (pre-test, post-test) by age group (younger, older) interaction, $F(1, 37) = 4.425$, $p = .042$, $\eta_p^2 = .107$. Post hoc paired samples *t* tests were conducted to assess this interaction. The post hoc tests revealed a significant increase from pre- ($M = 55.95$, $SD = 12.190$) to post-test ($M = 53.58$, $SD = 11.529$) for younger participants, $t(18) = 2.146$, $p = .046$, $d = .20$, indicating increased shift dysfunction. There was no significant effect reported for the older participants ($p > .05$).

The ANOVA also revealed a time (pre-test, post-test) by condition (Mindful Me!, control) interaction, $F(1, 37) = 4.099$, $p = .050$, $\eta_p^2 = .100$. Post hoc paired samples *t* tests were conducted to assess this interaction. The post hoc tests revealed no significant changes for the Mindful Me! or the control condition for their scores from pre- to post-test (*p*s > .05).

The ANOVA further indicated a time (pre-test, post-test) by age group (younger, older) by condition (Mindful Me!, control) interaction, $F(1, 37) = 9.144$, $p = .005$, $\eta_p^2 = .198$. Post hoc paired samples *t* tests were conducted to assess this 3-way interaction. The post hoc analysis reported a significant pre-post decrease for the younger participants from the Mindful Me! condition. Younger participants from the Mindful Me! condition had a significant decrease in scores for Shift (Mean Differential = -5.40, $SD = 3.565$), $t(9) = 4.790$, $p = .001$, $d = .35$. This indicates that younger children from the Mindful Me! condition decreased their score in shift from pre- ($M = 57.50$, $SD = 14.759$) to post-test ($M = 52.10$, $SD = 13.220$), representing an improvement in shift function. No further significant effects were reported for the age groups and conditions as a result of the post hoc analyses.

Emotional Control. A repeated – measures ANOVA revealed a significant main effect for time (pre-test, post-test), $F(1, 37) = 4.960$, $p = .032$, $\eta_p^2 = .118$. The total Emotional Control scores at pre-test ($M = 50.83$, $SD = 9.869$) were higher relative to post-test ($M = 48.34$, $SD = 11.139$), indicating decreased scores in Emotional Control. This represents an improvement in function for Emotional Control from pre- to post-test. No further significant main effects or interactions were found as a result of the ANOVA analysis for Emotional Control.

Initiate. A repeated – measures ANOVA revealed a significant time (pre-test, post-test) by condition (Mindful Me!, control) interaction, $F(1, 37) = 4.192$, $p = .048$, $\eta_p^2 = .102$. Post hoc paired samples *t* tests were conducted to assess this interaction. The post hoc tests revealed that participants from the control condition had significantly decreased scores from pre- ($M = 52.53$, $SD = 10.745$) to post-test ($M = 49.76$, $SD = 8.596$), $t(20) = 2.285$, $p = .033$, $d = .28$, indicating improvements in Initiate from pre- to post-test. No further significant main effects or interactions were reported as a result of the ANOVA analysis for Initiate.

Organization of Materials. A repeated – measures ANOVA revealed a significant time (pre-test, post-test) by condition (Mindful Me!, control) interaction, $F(1, 37) = 4.766$, $p = .035$, $\eta_p^2 = .114$ interaction. Post hoc paired samples *t* tests were conducted to assess this interaction. The post hoc tests revealed no significant changes for the Mindful Me! or the control condition for their scores from pre- to post-test ($ps > .05$). No further significant main effects or interactions were reported for Organization of Materials as a result of the ANOVA analysis.

Behavioural Regulation (BRI). A repeated – measures ANOVA revealed a significant main effect for age group (younger, older), $F(1, 37) = 4.630$, $p = .038$, $\eta_p^2 = .111$. The younger participants had a higher mean score ($M = 54.317$, $SD = 2.274$) relative to the older participants ($M = 47.639$, $SD = 2.119$), indicating a higher level of dysfunction in Behavioural Regulation for younger participants. No further significant main effects or interactions were reported as a result of the ANOVA analysis.

Hypothesis 2: Improvements in Emotion Regulation

The second hypothesis proposed was that children from the Mindful Me! condition were expected to gain improvements in emotional regulation skills compared to children from the control condition, as indicated in previous literature. Emotional regulation was measured by the Mood and Anxiety Symptom Questionnaire – Anxious Arousal (MASQ – AA), Resiliency

Inventory (RI), which includes the optimism and emotional control subscales, and the Children's Response Styles Questionnaire – Rumination Scale Revised (CRSQ – RSR).

Pre- and post-test scores were compared using a repeated – measures analysis of variance. The analyses used a 2(condition: Mindful Me!, control) x 2(age group: younger, older) x 2(time: pre-test, post-test) design, with condition and age group as the between-subject variables and time as the within-subject variable. Post hoc *t* tests were conducted to assess significant interactions. Further planned *t* tests were conducted to address the exploratory component. The analyses will begin with the MASQ – AA.

Mood and Anxiety Symptom Questionnaire – Anxiety Arousal (MASQ – AA). Group means and *SD*s for the MASQ – AA are reported in Table 6. No outliers were reported. A repeated – measures ANOVA revealed a condition (Mindful Me!, control) by age group (younger, older) interaction, $F(1, 94) = 4.980$, $p = .028$, $\eta_p^2 = .050$. Independent samples *t* tests were conducted to further assess differences between the conditions and age groups at pre-test and at post-test. The independent samples *t* tests revealed no significant difference between the younger and older participants in the control condition at pre-test ($p > .05$). However, there was a significant difference between the younger and older participants in the control condition at post-test, $t(44) = 2.048$, $p = .047$. The younger participants had significantly higher scores (M = 21.17, SD = 10.268) relative to the older participants (M = 16.17, SD = 5.622) at post-test. The independent samples *t* tests revealed no significant differences between the younger and older participants from the Mindful Me! condition at pre-test and at post-test (*p*s > .05).

Independent samples *t* tests were also conducted to assess differences within the older children between the Mindful Me! and control conditions and also to assess differences within the younger children between the conditions at pre-test and at post-test. There was no significant difference found within the younger participants between the Mindful Me! and control conditions at pre-test and at post-test ($p > .05$). There were no significant differences found within the older participants between Mindful Me! and control conditions at pre-test and at post-test (ps > .05).

Overall, the analyses for the MASQ – AA did not reveal any results consistent with hypothesis 2. There were no significant findings reported for the younger or older participants from either the Mindful Me! or the control condition for anxiety arousal.

Resiliency Inventory (RI) total. Group means and *SD*s for the RI - total are reported in Table 6. The scores for the RI total included both the optimism and emotional control subscales. An outlier was reported from a younger participant from the control group, therefore their data was excluded from this analysis.

A repeated – measures ANOVA revealed a condition (Mindful Me!, control) by age group (younger, older) interaction, $F(1, 93) = 4.168$, $p = .044$, $\eta_p^2 = .043$. Independent samples *t* tests were conducted to further assess differences between the conditions and age groups at pre-test and at post-test. The independent samples *t* tests revealed no significant differences between the younger and older participants in the control condition at pre-test and at post-test ($p > .05$). In contrast, the independent samples *t* tests revealed a significant difference between the younger and older participants from the Mindful Me! condition at pre-test, $t(50) = 2.344$, $p = .023$. The younger participants had significantly higher scores ($M = 52.46$, $SD = 6.434$) relative to the older participants ($M = 48.29$, $SD = 6.366$). The independent samples *t* tests further revealed a significant difference between the younger and older participants from the Mindful Me! condition at post-test, $t(50) = 2.221$, $p = .031$. Similarly, younger participants had significantly higher scores ($M = 51.88$, $SD = 7.743$) relative to the older participants ($M = 46.92$, $SD = 8.335$).

Independent samples *t* tests were also conducted to assess differences within the older children between the conditions and also to assess differences within the younger children between the Mindful Me! and control conditions at pre-test and at post-test. There was no significant difference found within the younger participants between the Mindful Me! and control conditions at pre-test and at post-test ($p > .05$). There were no significant differences found within the older participants between Mindful Me! and control conditions at pre-test and at post-test (*p*s > .05).

Overall, the analyses for the RI did not reveal any results consistent with hypothesis 2. There were no significant findings reported for the younger or older participants from either the Mindful Me! or the control condition for resiliency.

Optimism subscale. The optimism subscale includes items 1 to 10 from the RI. Group means and *SD*s for RI - optimism are reported in Table 6. No outliers were reported for optimism. A repeated – measures ANOVA revealed no significant main effects or interactions for emotional control (*p*s > .05). In conclusion, the analyses for optimism did not reveal any results consistent with hypothesis 2. There were no significant findings reported for the younger or older participants from either the Mindful Me! or the control condition for optimism.

Emotional Control subscale. The emotional control subscale includes items 11 to 14 from the RI. Group means and SDs for RI – emotional control are reported in Table 6. An outlier was reported for a younger participant from the control condition, therefore their data was excluded from this analysis. A repeated – measures ANOVA revealed a condition (Mindful Me!, control) by age group (younger, older) interaction, $F(1, 93) = 5.567$, $p = .020$, $\eta_p^2 = .056$

Independent samples *t* tests were conducted to further assess differences between the conditions and age groups at pre-test and at post-test. The independent samples *t* tests revealed no significant differences between the younger and older participants in the control condition at pre-test and at post-test ($p > .05$). In contrast, the independent samples *t* tests revealed a significant difference between the younger and older participants from the Mindful Me! condition at pre-test, $t(50) = 2.447$, $p = .018$. The younger participants had significantly higher scores ($M = 18.92$, $SD = 2.567$) relative to the older participants ($M = 16.75$, $SD = 3.802$). The independent samples *t* tests further revealed a significant difference between the younger and older participants from the Mindful Me! condition at post-test, $t(50) = 2.391$, $p = .021$. Similarly, younger participants had significantly higher scores ($M = 18.88$, $SD = 2.579$) relative to the older participants ($M = 16.75$, $SD = 3.802$).

Independent samples *t* tests were also conducted to assess differences within the older children between the conditions and also to assess differences within the younger children between the conditions at pre-test and at post-test. The independent samples *t* tests revealed differences between the Mindful Me! and control conditions at pre-test for the younger participants, $t(48) = -2.240$, $p = .030$. The younger participants from the control condition had lower scores ($M = 16.81$, $SD = 4.087$) relative to the younger participants from the Mindful Me! condition ($M = 18.92$, $SD = 2.567$). There was no difference in scores found at post-test with the younger participants between the Mindful Me! or control conditions ($p > .05$). Additionally, there were no differences between Mindful Me! or control conditions with the older participants at pre-test and at post-test (ps $> .05$).

In conclusion, the analyses for emotional control did not reveal any results consistent with hypothesis 2. There were no significant findings reported for the younger or older participants from either the Mindful Me! or the control condition for emotional control.

Children's Response Styles Questionnaire –Rumination Scale Revised (CRSQ – RSR). Group means and *SD*s for CRSQ – RSR are reported in Table 6. No outliers were reported. A repeated – measures ANOVA revealed a main effect for time (pre-test, post-test), $F(1, 94) = 4.896$, $p = .029$, $\eta_p^2 = .050$. There was a decrease in scores for rumination from pre- ($M = 21.11$, $SD = 6.307$) to post-test ($M = 19.91$, $SD = 6.522$) for all participants.

The ANOVA further revealed a condition (Mindful Me!, control) by age group (younger, older) interaction $F(1, 94) = 9.767$, $p = .002$, $\eta_p^2 = .094$. Independent samples *t* tests were conducted to further assess differences between the conditions and age groups at pre-test and at post-test. The independent samples *t* tests revealed no significant differences between the younger and older participants in the control condition at pre-test ($p > .05$). In contrast, the independent samples *t* tests revealed a significant difference between the younger and older participants from the control condition at post-test, $t(44) = 2.406$, $p = .020$. The younger participants had significantly higher scores ($M = 22.04$, $SD = 7.021$) relative to the older participants ($M = 17.65$, $SD = 5.201$). The independent samples *t* tests further revealed a significant difference between the younger and older participants from the Mindful Me! condition at pre-test, $t(50) = -2.738$, $p = .009$. The younger participants had significantly higher scores ($M = 19.36$, $SD = 6.314$) relative to the older participants ($M = 23.96$, $SD = 5.706$).

Independent samples *t* tests were also conducted to assess differences within the older children between the conditions and also to assess differences within the younger children between the conditions at pre-test and at post-test. The independent samples *t* tests revealed differences between the Mindful Me! and control conditions at pre-test for the older participants, $t(45) = -2.778$, $p = .008$. The older participants from the control condition had lower scores ($M = 19.24$, $SD = 5.943$) relative to the older participants from the Mindful Me! condition ($M = 23.96$, *SD* = 5.706). There was no difference in scores found at post-test with the older participants between the conditions ($p > .05$). Additionally, there were no differences between conditions with the younger participants at pre-test and at post-test (*p*s > .05).

Planned paired samples *t* tests were conducted to address the exploratory component. The planned tests revealed a significant pre-post decrease in scores for the older participants from the Mindful Me! condition, $t(23) = 2.677$, $p = .013$, $d = .42$ (*M* and *SD* reported in Table 6). The older children from the control condition also had decreased scores from pre- to post-test (*M* and *SD* reported in Table 6), however, this decrease in scores was not significant, $t(22) = 1.581$, $p = .128$, $d = .28$. For the younger children, their mean scores also decreased from pre- to post-test in both conditions (*M*s and *SD*s reported in Table 6), but there were no significant decreases reported for either conditions (*p*s > .05).

Overall, the initial ANOVA analysis did not reveal a significant time by condition by age group 3-way interaction. However, the planned *t* tests, which were conducted to assess the exploratory component, revealed that it was only the older participants from the Mindful Me! condition who tended to score lower on the CRSQ – RSR from pre- to post-test. There were no further significant findings reported for the younger participants from either condition for the CRSQ - RSR.

Hypothesis 3: Improvements in Physiological Stress

The third hypothesis proposed was that children from the Mindful Me! condition would decrease in physiological stress, as indicated by lower blood pressure and heart rate data, compared to children from the control condition. Blood pressure was measured by systolic and diastolic pressure and by heart rate. Means and *SDs* for the blood pressure data are reported in Table 7.

The analyses used a 2(condition: Mindful Me!, control) x 2(age group: younger, older) x 2(session: before, after) design, with condition and age group as the between-subject variables and session as the within-subject variable. The analyses assessed whether blood pressure and heart rate data change from before participants initiated in the session, to after participated engaged in the session for weeks 2, 6 and 8. Post hoc *t* tests were conducted to assess significant interactions produced from the ANOVA. Further, planned *t* tests were conducted to address the exploratory component assessing age group differences.

The repeated – measures ANOVA revealed no consistent results in support of children's levels of stress from participating in either two conditions, as measured by blood pressure and heart rate levels. The ANOVA analyses only revealed significant results for heart rate and systolic pressure for older participants from the Mindful Me! condition. Specifically, there was a significant session (before, after) by age group (younger, older) by condition (Mindful Me!, control) interaction for heart rate, $F(1, 51) = 6.060$, $p = .017$, $\eta_p^2 = .106$. Post hoc paired samples *t* tests were conducted to assess this 3-way interaction. The post hoc tests revealed a significant increase in heart rate for the older participants from the Mindful Me! condition. For older participants from the Mindful Me! condition, their heart rates increased from before the mindfulness session ($M = 73.63$, $SD = 14.018$) to after the mindfulness session ($M = 80.56$, $SD = 17.347$) on week 2, $t(15) = -2.181$, $p = .046$, $d = .44$. Additionally, systolic levels significantly decreased from before the mindfulness session to after the mindfulness session in week 6 for older participants, $t(18) = 2.380$, $p = .029$, $d = .39$. For older participants, their mean systolic pressure decreased from before the mindfulness session ($M = 104.79$, $SD = 10.092$) to after the mindfulness session ($M = 100.89$, $SD = 9.888$), indicating a significant decrease in systolic pressure. No further significant findings were reported for the younger or older participants from either the Mindful Me! or the control condition in regards to BP and HR levels. For this reason, the main analyses for stress was not included in this paper. However, the results are available upon request of the author.

Hypothesis 4: Improvements in Academic Performance

The fourth hypothesis proposed was that children from the Mindful Me! condition were expected to achieve higher grades compared to children from the control condition, as indicated by grades in journal writing. Means and *SDs* for the journal grades are reported in Table 8. The analyses used a 2(condition: Mindful Me!, control) x 2(age group: younger, older) x 4(time: week 1, week 3, week 5, week 7) design, with condition and age group as the between-subject variables and time as the within-subject variable. Post hoc paired samples *t* test were conducted to assess significant interactions. Further planned *t* tests were conducted to address the exploratory component.

Journal Grades. A repeated – measures ANOVA revealed a main effect for age group (younger, older), $F(1, 63) = 21.668$, $p < .001$, $\eta_p^2 = .256$. The younger participants had a lower mean grade ($M = 3.06$, $SD = .055$) relative to the older participants ($M = 3.50$, $SD = .077$). The ANOVA further revealed a main effect for time (pre-test, post-test), $F(3, 61) = 2.835$, $p = .045$, $\eta_p^2 = .112$, which was qualified by the time (week 1, week 3, week 5, week 7) by condition (Mindful Me!, control) interaction, $F(3, 61) = 4.859$, $p = .004$, $\eta_p^2 = .193$. Post hoc paired samples *t* tests was conducted to assess this interaction. For example, week 1 and week 3 were compared, week 1 and week 5 were compared, week 1 and week 7 were compared, etc. Post hoc comparisons were interpreted using the Bonferroni correction ($\alpha = 0.05/6 = .008$), and *p* values > .008 were deemed nonsignificant.

The post hoc analyses revealed a significant effect reported for the younger children from the Mindful Me! condition when comparing week 3 and week 5, $t(26) = -4.107$, $p < .001$, $d = .81$, indicating that their mean grade increased from week 3 ($M = 2.579$, $SD = .912$) to week 5 ($M = 3.241$, $SD = .704$). There were no other significant effects for the younger participants in either of the conditions. For the older participants in the control condition, there was a significant effect when comparing week 3 and week 5, $t(13) = 3.733$, $p = .003$, $d = 1.44$, indicating that their mean grade decreased from week 3 ($M = 3.69$, $SD = .234$) to week 5 ($M = 3.37$, $SD = .211$). There was also an additional significant effect found for the older participants in the control condition when comparing week 3 and week 7, $t(17) = 4.187$, $p = .001$, $d = .93$, indicating their mean grade decreased from week 3 ($M = 3.58$, $SD = .288$) to week 7 ($M = 3.31$, $SD = .295$). No additional significant effects were reported for the older participants in either of the conditions (ps > .05).

The gender differences will now be addressed, as preliminary analyses reported that females had a significantly higher grades at week 1 ($M = 3.38$, $SD = .519$) compared to males ($M = 2.87$, $SD = .835$). A 2(condition: Mindful Me!, control) x 2(age group: younger, older) x 2 (gender: male, female) x 4(time: week 1, week 3, week 5, week 7) repeated – measures analysis was conducted. The ANOVA revealed a significant gender effect, $F(1, 59) = 11.332$, $p = .001$, $\eta_p^2 = .161$. On week 1, the females had higher grades ($M = 3.36$, $SD = .571$) compared to males ($M = 2.94$, $SD = .624$), indicating higher grades for females on week 1. On week 3, the females had higher grades ($M = 3.13$, $SD = .630$) compared to males ($M = 3.05$, $SD = .728$), indicating higher grades for females on week 3. On week 5, the females had higher grades ($M = 3.54$, $SD = .399$) compared to males ($M = 3.16$, $SD = .541$), indicating higher grades for females on week 5. On week 7, the females had higher grades ($M = 3.30$, $SD = .534$) compared to males ($M = 3.12$, $SD = .370$), indicating higher grades for females on week 7. No further significant main effects or interactions were reported. Future studies may have to consider gender differences in response to the mindfulness intervention.

In general, the analyses for the journal grades did not reveal conclusive evidence in support of hypothesis 4. The results revealed that younger children from the Mindful Me! condition had increased mean grades from week 3 to week 5. However, this result should be interpreted with caution, since their scores decreased from week 1 to week 3. This result is not indicative of an increase in journal grades for younger children from the Mindful Me! condition. Further, the analyses revealed that older children from the control condition significantly decreased their grades from week 3 to week 5. Furthermore, their mean journal grades significantly decreased from week 3 to 7. This indicates a slight decrease of journal grades starting from week 3 for the older children from the control condition. There were no further significant effects found for the younger or older children from either the Mindful Me! or the control condition.

Discussion

This study assessed whether there were benefits to implementing a mindfulness-based program for children, compared to children from a control condition. There were 4 hypotheses under study based on empirical evidence found from previous literature. First, it was expected that children from the Mindful Me! condition would have acquired higher scores in EF relative to children who participated in the active control condition. Second, it was expected that children from the Mindful Me! condition would have gained greater emotional regulation abilities upon completion of the mindfulness program compared to children from the active control condition. Third, it was expected that children from the Mindful Me! condition would experience less stress compared to children from the active control condition, as demonstrated by lower blood pressure and heart rate levels from before the session to after the session. Finally, it was expected that the Mindful Me! program would help children improve in academic performance compared to children from the active control condition, as demonstrated by increased journal grades. Results from the current study demonstrated limited improvements in response to the Mindful Me! program across a range of outcomes for children at different developmental stages.

For the first hypothesis, the analyses assessed the effects of mindfulness on EF competencies to determine whether there were changes in EF scores across a variety of tasks that were administered to children before and after the two programs. The tasks assessed the key components involved in EF, including working memory, inhibition, and cognitive flexibility. For working memory, the results revealed that younger children from the Mindful Me! program appeared to benefit the most. Specifically, younger children from the Mindful Me! condition profited in outcomes in the forward portion of the working memory task. Younger children from both conditions had increased scores from pre- to post-test in regards to LDSF. However, younger children from the Mindful Me! condition performed significantly better relative to the younger children from the active control condition. For older children from both conditions, their scores decreased from pre- to post-test for LDSF, however, the older children from the Mindful Me! condition did significantly worse. In regards to DSF, younger children from both conditions acquired increased DSF scores from pre- to post-test, but it was the younger children from the Mindful Me! condition who had significantly higher scores relative to younger children from the active control condition. For older children, they had similarly decreased scores from pre- to post-test in regards to DSF, however it was the older children from the Mindful Me! condition who had significantly lower scores relative to the older participants from the active control condition. For the backward portion of the working memory task, there were no significant effects reported for the younger or older children from either conditions. For inhibition, the Stroop Task was administered and the results revealed significant decreased accuracy scores from pre-to post-test for the older children from both conditions. There were no further significant effects revealed for the younger children from either conditions for inhibition. Cognitive flexibility was assessed by the Dimensional Change Card Sort task (DCCS). The results revealed that younger children from both conditions had acquired higher scores on the border phase of the DCCS task from pre- to post-test. Though, it was the younger children from the Mindful Me! condition who acquired significantly higher scores from pre- to post-test compared to younger children from the active control condition. Older participants from both conditions also had higher scores from pre-to post-test, however, no significant effects were reported. In regards to the BRIEF, no conclusive reports were found to address the first hypothesis. Further, the validity of the BRIEFs is in question as there were only limited returned BRIEFs at post-test. Therefore, the results should be interpreted with caution. However, the results for the BRIEF revealed higher levels of executive dysfunction for the younger participants in general. More specifically, younger children in general had higher levels of dysfunction in scales including inhibit, shift, and behavioural regulation. In terms of condition differences, children from the active control condition had significantly higher levels of initiate function. No further effects were reported.

The results of the first analyses provide limited support for the first hypothesis. The results of the EF measures revealed that younger children from the Mindful Me! condition benefited the most from the intervention in regards to the forward portion of the working memory task and in cognitive flexibility. For older children, no significant improvements in EF skills were found as a result of the intervention. This lack of a finding for older children may be a consequence of older children's EF abilities being already developed at the developmental ages under study. However, there were significant decreases in the forward portion of the working memory task and for inhibition accuracy for the older children from the Mindful Me! condition. These decreases cannot be fully explained and there may be a variety of factors that may have contributed to this result. Since the present study contained an active control condition, these results may indicate a more complex picture of mindfulness. If these results are duplicated in future research, mindfulness should be assessed more stringently.

For the second hypothesis, the effects of mindfulness on emotional regulation were considered to determine whether there were changes in emotional regulation across a variety of self-report measures administered to children before and after the programs. The measures included the Mood and Anxiety Symptom Questionnaire (MASQ – AA), Children's Response Style Questionnaire (CRSQ – RSR), and the Resiliency Inventory (RI). The results from the current study did not demonstrate enough evidence to support the second hypothesis. The findings from the MASQ – AA and RI (optimism, emotional control) failed to reveal any support for the use of the intervention on children's emotional regulation abilities. However, the results revealed only limited support for the use of the mindfulness intervention for older children in regards to rumination. More specifically, the older children from both conditions acquired lower scores from pre- to post-test on the CRSQ – RSR scale. However, it was only the older children from the Mindful Me! condition who had significantly lower scores in rumination relative to the older children from the active control condition. Though, the results in regards to rumination is limited since the initial ANOVA did not reveal a significant 3-way interaction and the findings were revealed as a result of planned tests. There were no further significant effects reported in the remaining self-report measures in emotional regulation abilities for the younger and older children from either conditions.

For the third hypothesis, the results from the current study did not provide conclusive evidence in support of regulating children's levels of physiological stress from participating in the mindfulness intervention. The results only revealed effects to heart rate and systolic pressure for older children from the Mindful Me! condition. Specifically, the heart rate of older children from the Mindful Me! condition increased in week 2 from before the mindfulness session to after the mindfulness session. Additionally, systolic levels significantly decreased from before the mindfulness session to after the mindfulness session in week 6 for older children. No further significant findings were reported for the younger or older children from either the Mindful Me! or the control condition in regards to BP and HR levels.

For the fourth hypothesis, the results of the current study did not demonstrate enough evidence to conclude that the mindfulness intervention can be used as a tool help children to perform better academically. Findings from the analyses reported that younger children from the Mindful Me! program saw significant improvements in journal grades from week 3 to week 5. However, this result should be interpreted with caution, since their scores decreased from week 1 to week 3. No additional significant effects were reported for the younger children from either the Mindful Me! or the control condition. The summary of means from Table 6 revealed that the younger children from the Mindful Me! program had relatively the same grades from week 1 to week 7. For children from the active control condition, their journal grades slightly increased from week 1 to week 7. Further, the analyses revealed that older children from the control condition significantly decreased their grades from week 3 to week 5. Furthermore, their mean journal grades significantly decreased from week 3 to 7. This indicates a slight decrease of journal grades starting from week 3 to week 7 for the older children from the active control condition. For older children from the Mindful Me! condition, their scores stayed relatively the same from week 1 to week 7. Overall, the results from the current study do not provide enough empirical evidence in support of the mindfulness intervention for improvements in journal grades for children.

Implications. The findings from the current study exhibited limited improvements for children as a result of the mindfulness intervention. Understanding differences in how children respond to interventions is useful, as there may be a need to modify interventions based on different developmental stages. The Mindful Me! program appeared to be beneficial for younger and older children in different ways. The results of the study suggested that younger children's EF abilities benefit from the intervention offered. Specifically, younger children had significantly higher gains in the forward portion of the digit span subtest and for the border phase of the DCCS (indexed by working memory and cognitive flexibility) relative to younger children from the active control condition. Older children who participated in the mindfulness program benefitted from the intervention in terms of their emotional regulation. Older children's rumination scores decreased from pre- to post-test in the mindfulness condition, demonstrating that the mindfulness intervention facilitated lower rumination for the older children in comparison to older children from the active control condition. In contrast, the results showed decreases in the forward portion of the working memory task for older children from the Mindful Me! condition. The findings from the present study suggest that different interventions may be better suited for children of different ages, and depending on development stage, the effectiveness of an intervention can vary.

The present study demonstrated only limited improvements in EF abilities as a result of the intervention for younger children. EF emerges as early as infancy, and does not fully develop until young adulthood (Diamond, 2016). EF is very sensitive to environmental factors and different approaches can improve EF (Diamond, 2016). The findings from the current study suggests that mindfulness can be a potential tool to foster EF skills in children early in life. Mindfulness requires attention and awareness. A state of mindfulness allows one to focus their attention entirely on the present moment and to bring one's attention back to the present if the mind starts to wander or become distracted. EF also requires attention and focus. This study supports the notion that mindfulness practices can stimulate these characteristics, especially in younger children, who can improve in EF skills due to mindfulness interventions.

It is imperative to stimulate EF skills in children as early as possible. EF skills early in life also predicts EF skills later in life (Diamond, 2016). Between the ages of 4 and 8, EF is the most intense and between the ages of 3 and 5, EF has the biggest window for development (Center on Developing Child, Harvard University, 2011). Although the current study had participants starting from age 7, earlier intervention is critical for children who are at risk for social and economic disadvantage (Diamond, 2016). Disadvantaged children fall behind each school year and are vulnerable to mental and physical health problems (O'Shaughnessy et al., 2003; Adler & Newman, 2002; Gianaros, 2011). Thus, future studies should consider administering mindfulness as early as possible to help disadvantaged children reach the same level of success as their peers.

For younger children, the present study found specific improvements in working memory and cognitive flexibility. Working memory and inhibitory control were found to predict both math and reading competence throughout school (Diamond, 2016). The present study found no effects on inhibitory control for younger children, consistent with previous literature (e.g. Flook et al., 2015). Further, the results from the current study demonstrated higher levels of inhibit dysfunction for younger children in general. Previous literature has stated that inhibitory control is difficult for young children and continues to improve throughout adolescence (Diamond, 2016). Additionally, the literature suggests that improvement of executive control has been noted to increase until the age of seven, but not thereafter (Rueda et al., 2004). This can explain why no effects on EF were found for older children in the present study. In regards to cognitive flexibility, younger children from the Mindful Me! condition acquired higher scores at post-test from baseline levels on the border phase of the DCCS task. Diamond (2016) reported that cognitive flexibility emerges later than working memory and inhibitory control. This is an interesting report given that younger children from the Mindful Me! program increased in cognitive flexibility from pre- to post-test. These results may suggest that mindfulness interventions can be used as an approach to galvanize skills in cognitive flexibility earlier than suggested.

For older children, the results of the current study revealed only limited benefits as a result of the mindfulness intervention for emotional regulation skills. There were no effects reported for mood, anxiety and for resiliency. However, the results did a reveal significant effect for the CRSQ – RSR scale, which measured levels of rumination. Rumination is a cognitive process and involves abstract, repetitive, and negative thinking styles, which leads to the maintenance of negative emotions (Smith & Alloy, 2009). Older children from the Mindful Me! conditions seemed to benefit the most from the intervention, as indicated by lower rumination scores from pre- to post-test relative to the older children from the active control condition. There were no findings reported for the younger children from either conditions for rumination. A study by Baiocco et al. (2017) on a sample of children from ages 7 to 12 found that early adolescent children (10-12 years) tended to ruminate more than younger children (7–9 years). Younger children tend to understand happy situations compared to situations that elicit negative emotions (Denham & Couchoud, 1990; Fabes, Eisenberg, Nyman, & Michealieu, 1991). Therefore, it is important to consider early adolescence as a risk factor for increased negative ruminative patterns. Rumination can lead to several psychopathological symptoms during adolescence, such as anxiety, binge eating, binge drinking, and self-harm behaviours (Papadakis, Prince, Jones, & Strauman 2006; Rood, Roelofs, Bogels, Nolen-Hoeksema, & Schouten, 2009; Mellings & Alden, 2000; Nolen-Hoeksema et al. 2007; Hilt et al. 2008; Hoff & Muehlenkamp, 2009).

The results of the present study suggest that mindfulness practices can potentially be used as an approach to teach early adolescent children to regulate or decrease their ruminative patterns. Rumination increases with age, and it is thought that school pressures may be the cause of rumination as children develop (Gibb, Grassia, Stone, Uhrlass, & McGeary, 2012; Jose & Brown 2008). The study by Baiocco et al. (2017) further revealed that older children ruminate about school issues the most compared to younger children. For children, emotional regulation is central to school learning and academic success (Raver & Zigler, 1997; Denham, 2006). Previous literature has also demonstrated that emotional regulation can predict academic success (e.g. Carlton, 1999; Howes & Smith, 1995; Izard, Fine, Schultz, Mostow, Ackerman, & Youngstrom, 2001; Jacobsen & Hofmann, 1997; O'Neil, Welsh, Parke, Wang, & Strand, 1997; Pianta, 1997; Pianta, Steinberg, & Rollins, 1995; Shields, Dickstein, Seifer, Giusti, Magee, & Spritz, 2001). There is a need for further study to assess how mindfulness programs can foster positive experiences in school so that children will not have negative reactions to school life. Mindfulness does not involve changing the content of thoughts, feelings, and bodily sensations, but it does potentially change the ways individuals react to these thoughts, feelings, and bodily sensations. Mindfulness encourages individuals to acknowledge and accept internal experiences for what they are and to be nonjudgmental. Mindfulness practices can lead to the prevention of ruminative thoughts becoming overwhelming, which often leads to excessive worry or anxiety. If the present study's findings are replicated and expanded by future research, mindfulness should be used as a technique to assist early adolescent children in coping with excessive ruminative patterns.

It should also be noted that older children who participated in the Mindful Me! condition had higher levels of baseline rumination scores in contrast to older children from the control condition. The randomization of children into the specified conditions tried to be maximized across the other measures under study. However, it seems that for the CRSQ – RSR, which assessed rumination, older children from the Mindful Me! condition scored higher in rumination levels. This difference should be noted and the results should be interpreted with caution. Previous studies have also reported that participants with lower baseline levels in an intervention condition showed greater improvements relative to a control group (e.g. Flook et al., 2015). This pattern of results is consistent with previous research, which documented larger gains for children with poorer baseline function (e.g. Diamond & Lee, 2011; Bierman, Nix, Greenberg, Blair, & Domitrovich, 2008). The results of the present study suggest that there are benefits generally for older children in terms of reducing levels of rumination and that children with deficits in rumination may experience additional gains.

In regards to blood pressure and heart rate levels, there were no consistent evidence in the present study that supported the use of mindfulness as an approach to decrease systolic and diastolic pressure and heart rate levels for children. The present study revealed increased heart rate for older participants from the Mindful Me! condition in week 2 and decreased systolic pressure for older participants from the Mindful Me! condition in week 6. Previous literature has also provided inconclusive reports for the effects of mindfulness on BP and HR for children. For example, as stated in the literature review, the current literature reports significant decreases in systolic pressure (e.g. Barnes et al., 2001; Barnes et al., 2004; Barnes et al., 2008), but no consistent results for diastolic pressure (e.g. Barnes et al., 2001; Barnes et al., 2004). For heart rate, there is a lack of literature and no conclusive evidence has yet to support mindfulness as an approach to decrease heart rate levels for children. In the present study, increased heart rate was evident in week 2 for older children from the Mindful Me! condition.

There is potential for future research to examine specific mindfulness activities, such as mindful movements, and to scrutinize more closely each specific activity's impact on stress as measured by BP and HR. In week 2, the Mindful Me! theme in focus was mindful movements, an activity where children were instructed to do a variety of poses. In week 6, there was evidence for decreased systolic pressure. The Mindful Me! theme for week 6 was a focus on worry, and children were taught skills to reduce anxiety. It is not yet known whether these activities specifically decreased or increased BP and HR levels and there can be no firm conclusions drawn as the evidence only supported significant findings in weeks 2 and 6. Research needs to be expanded to add to the existing literature in order to provide conclusive evidence as to whether children can benefit from mindfulness as a method of reducing stress long-term.

The present study also examined the potential effects of mindfulness on academic performance. The results did not demonstrate enough evidence to conclude that the mindfulness intervention can be used as a tool help children to perform better academically. Previous literature has demonstrated some support that mindfulness training has the ability to directly affect children's capacity to do well in specific subject areas taught in the classroom. For example, the literature has indicated improvements in learning about geometry, improvements in reading and science, and improvements in math performance (e.g. Shoval, 2011; Bakosh et al., 2016; Singh et al., 2016). The findings from the current study revealed that younger children from the Mindful Me! condition had significantly increased journal grades from week 3 to week 5. On the other hand, their scores decreased from week 1 to week 3, as indicated in the summary of journal grades in Table 6. As a result, the findings for younger children from the Mindful Me! condition is not conclusive. The younger children from the Mindful Me! condition had relatively the same journal grades from week 1 to week 7. For younger children from the active control condition, their journal grades increased from week 1 to week 7. As a results, the findings from the results remain inconsistent for the younger children. For the older children, the analyses revealed that those from the control condition significantly decreased their grades from week 3 to week 5. Furthermore, their mean journal grades significantly decreased from week 3 to 7. This indicates a slight decrease of journal grades starting from week 3 for the older children from the active control condition. In general, however, their grades remained relatively the same from week 1 to week 7. These general findings were also evident for the older children from the Mindful Me! condition. Overall, the results from the current study do not provide enough empirical evidence in support of the mindfulness intervention for improvements in journal grades for children. Further evidence of the effects of mindfulness on a variety of subject areas requires further investigation before any general conclusions can be drawn.

Limitations and Future Directions.

There were a few limitations that should be noted. The present study is limited by the relatively small sample size in each of the conditions under study. A larger sample size might have allowed for the possibility of examining differences in the patterns of mindfulness along age groups or for different grades. It is important to consider the effects of mindfulness across different ages and development periods. An exploration of the relationship between mindfulness, EF, emotional regulation, stress, and academic performance based on age, would be helpful in assessing the developmental nature of mindfulness. As a result, more mindfulness measures would have been helpful in understanding the developmental nature of mindfulness in this study. For example, a mindfulness measure that assessed awareness and acceptance in addition to attention could have been used in the current study. Further research should examine all facets of mindfulness, including attention, awareness and acceptance, in children within a developmental framework that recognizes that EF and emotional regulation emerge and change across early childhood and early adolescence.

Another limitation of the current study pertains to the two programs. The two programs that were administered to the children were very similar in nature, which may be the reason why some outcomes were not consistent with the proposed hypotheses. For example, the activities in the Social Skills program, including Kindness, Introduction to Values, and the Kindness Tree, are in line with mindfulness components of compassion. Since mindfulness can cultivate attention, the qualities of kindness and care toward the self and others can form implicitly and explicitly (Flook, 2015). Self-compassion is a key component of mindfulness, which was in focus for the Mindful Me! program. The activities for self-compassion included ‘Letting Go of Anger”, Gratitude, and the Worry activities. These activities emphasized compassion toward the self during difficult times, acknowledging that it is difficult, and learning how to cope and care for the self at these specific moments. On the other hand, the activities mentioned in the Social Skills program are focused on compassion toward others, not the self. This includes showing empathy and compassion for others' feelings. In order to assess whether the mindfulness activities are effective and if they are in fact different from the activities of other social and emotional learning interventions, additional research needs to be conducted on the specific nature of the activities from the mindfulness intervention.

A further limitation that should be noted was that it was not known whether the administration and implementation of the mindfulness intervention was effective for all children. Meiklejohn et al. (2012) provided a review on the many challenges faced by the implementation of mindfulness-based programs within school settings, such as (a) the continued refinement of adapting well established adult mindfulness programs for younger children, (b) lack of agreement on the ways to measures effectiveness through scientific research, (c) motivation of schools to stick to the program, (d) the changes to the school's educational policies and budgeting (e) the need for funding, (f) finding trained mindfulness teachers to teach teachers, students, and parents, and (g) finding time within the curriculum and finding the space within a school to practice. Further research needs to be expanded to assess these challenges faced in school in order to provide effective implementation of mindfulness-based programs across a variety of schools.

Another limitation of the present study is the reliance on youth self-report for most measures. Future research should examine the extent to which parent report (BRIEF) of student behavior is consistent with youth self-report. This may be facilitated by engaging in more in-depth studies incorporating qualitative approaches, such as observations and student interviews, combined with other measures to allow the complexities of the construct of mindfulness to be explored from a developmental perspective. Observations may also provide assessment of which mindfulness strategies work in the classroom and which strategies are appropriate at different developmental stages. Longitudinal assessment tools may further recognize developmental differences that are apparent across childhood and early adolescence, and are critical to understanding which mindfulness techniques work. Studies with longer follow-up periods are needed to identify the impact of mindfulness training delivered in education on long-term well-being and academic outcomes. Longitudinal assessment tools will also allow researchers to explore how mindfulness affects different subject areas across the developmental stages of children and adolescents.

Another methodological issue was the use of a blood pressure machine to assess physiological stress in children. First, there were several occasions during the study where the machine produced errors when collecting data on BP and HR levels. Future studies may consider collecting cortisol as a more accurate and reliable measure of stress in children. Secondly, since the findings for BP and HR were reported at specific weeks, it may be an indication that only specific mindfulness activities can affect BP and HR. Future research should consider whether specific mindfulness activities or techniques have a greater impact on BP and HR than others. Third, the present study assessed physiological stress outcomes in children. However, there are a varying forms of stress that should be considered in future studies. For instance, there are emotional and psychological forms of stress. Additionally, there can be different types of stress, including acute and chronic types of stress. Future research may consider administering scales or measurements that can evaluate the specific type of stress children are experiencing, and assessing how children respond to the mindfulness intervention depending on the form or type of stress they are experiencing. Another suggestion is manipulating stress outcomes in children in a controlled study. Future studies can induce a stressful situation, such as providing children with a math test, and then administer mindfulness to reduce children's stressful reaction to the math test. These proposed research ideas can provide empirical evidence on children's response to mindfulness. Future research should further consider and explore the effectiveness of mindfulness on children's stress outcomes.

Finally, another limitation of the present study were the journal assessments administered to children. The journal grades were not reflective of children's true writing skills as assessed by teachers. It would have been a great advantage to obtain actual grades from report cards as assessed by student's classroom teachers, since teachers were blind to the conditions for the current study. Future research should consider assessing grades as rated by teachers and making sure that the teachers are blind to the conditions.

Conclusion. In conclusion, the current study suggests that mindfulness can benefit children in different ways, particularly at different developmental stages. This study demonstrated limited support that mindfulness can improve EF skills in younger children and that mindfulness can improve emotional regulation abilities for older children. This study provided an example of the usefulness of implementing a mindfulness-based school program. Although there were no conclusive findings in relation to academic success, the present study exemplifies a greater need for further research to assess the effects of mindfulness on academic performance. It is crucial to assess tools in assessing and evaluating a student's performance in his/her academic, social, and emotional learning experience. As a result, students will be able to experience an alternate why of approaching education and learning through a cognitive, developmental, and socio-emotional perspective.

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Table 1
Age and Gender Distribution by Condition (Mindful Me!, Control) and Age Group (Younger, Older)

	Younger		Older	
	Mindful Me! n (%)	Control n (%)	Mindful Me! n (%)	Control n (%)
Age				
7	2 (50)	2(50)		
8	12 (60)	8 (40)		
9	12 (50)	12 (50)		
10	2 (66.7)	1 (33.3)		
12			8 (53.3)	7 (46.7)
13			16 (50)	16 (50)
Gender				
Male	13 (54.2)	11 (45.8)	13 (52)	12 (48)
Female	15 (55.6)	12 (44.4)	11 (50)	11 (50)
Total	28 (54.9)	23 (45.1)	24 (51.1)	23 (48.9)

Table 2
Mindful Me! Program Displaying the Corresponding Activities

Week	Activity	Description
1	Relaxation	Children learn proper breathing techniques and complete body scan
2	Mindful Movements	Children will learn yoga poses and stretching. Children are encouraged to focus on their physical and mental strength.
3	Self-Compassion ('Letting Go of Anger')	Children will be taught to let go of anger and other negative emotions. Children will be instructed to hold a gem in their hand and think of someone or something that hurt or frustrated them. Children will be instructed to drop the gem into a jar filled with water while focusing on the gem settling to the bottom of the jar. While the gem settles to the bottom of the jar, children will be encouraged to picture their own anger settling inside their head and their hearts.
4	Gratitude (thankfulness)	Children will be asked to fill out and decorate a gratitude mind map by remembering all of the people in their lives that they are thankful for. Children will then be encouraged to share their thoughts and experiences with their peers.
5	Mindful Listening	Children will sit or lie down comfortably and close their eyes while a rain forest nature soundtrack plays. Children will be instructed to pay close attention to all of the different noises they hear. Children will write down what they heard after the soundtrack finishes and will share with their peers.
6	Worry	Glitter bottles will be distributed to children. Glitter bottles consisted of bottles filled with water and corn syrup with glitter and drops of food colouring. The activity had three components, including conscientious breathing and calming of anxiety-inducing thoughts. Children will shake

		the bottles during the activities and will be encouraged to focus on the glitter sifting and swirling to the bottom of the bottle.
7	Mindful Eating	Activity consists of children eating raisins mindfully. The activity asks children to apply all five senses to eating.
8	Spider Man	Incorporates mindful movements, mindful listening, and a body scan.

Table 3
Social Skills Program Displaying the Corresponding Activities

Week	Activity	Description
1	Snowball Charades	Children will be asked to crumble a sheet of paper like a snowball. Sheets of paper include an emotion word, such as happy, excited, shy, nervous, frustrated, scared, confused, angry, sad, and grumpy. Children will take turns picking a snowball and expressing the emotion indicated in the snowball. Peers will guess and learn the emotion being expressed.
2	Make a Wish	Children will be instructed to make a positive wish for a child in another country in a wish box. Once complete, children will discuss their wishes with their peers.
3	Kindness	Children will give a complement to a peer. Children will receive a 'Certificate of Awesomeness' and write down their compliment about their peer. Once complete, children will give the certificate to their peer and be asked one-by-one to share their compliment.
4	In the Shoes of Another (empathy)	One-by-one, each child will pick a shoe box and read a scenario from the shoe box. The group will have a discussion on how they think the person feels in the scenario and will have a discussion on how they can show compassion toward the 'person in the shoes.'
5	What Does a Good Citizen Do?	Children will be asked to write what they think a good citizen does in the community on a sheet of paper and then will be instructed to stick the sheet of paper on a human shape with the word citizen on it. The group will discuss their ideas.
6	Introduction to Values	Different values will be presented to children, such as having good grades, having fun, spending time with family, honesty, and being

		popular. Children will rate how important the values are to them from 1 being the most important to 5 being not at all important. Once rated, children will place the values in containers labeled from 1 to 5. Group discussion will center on how the values were rated and will be asked why the value is important to them or how their parents would have rated the value.
7	Kindness Tree	Children will be given two leaves and will be instructed to write down on the leaf an act of kindness they did that day, whether they say someone practicing kindness, or naming any words of kindness or kindness sharing. They will take turns placing the leaf on a cardboard cut-out of a tree.
8	Team Work Grade 2-4	There are three dice that children will take turns rolling. The first die has actions, such as jumping jack, crab walk, hop on one foot, jump back and forth, and spin. The second die has the numbers 1 to 6. The third die has other actions children will be required to perform while doing actions from the first die, such as click tongue, quacking, whistling, finger on nose, close your eyes, and lock arms. The activity requires a child to roll all three dice and do the actions from the first and third dice simultaneously a number of times depending what they roll on the second die. Children will work together to perform the actions as a group.
8	Team Work Grade 7 and 8	Children were asked to play a game of Guesstures, similar to the game of charades. Teams were created and one person from each team were asked to choose a card and act out a word. The team had to guess the word that they were acting out.

Table 4

Pre- and Post-Test Means and Standard Deviations for Executive Function Tasks

	Younger						Older					
	Mindful Me!			Control			Mindful Me!			Control		
Variable	*n*	Pre-test *M* (*SD*)	Post-test *M* (*SD*)	*n*	Pre-test *M* (*SD*)	Post-test *M* (*SD*)	*n*	Pre-test *M* (*SD*)	Post-test *M* (*SD*)	*n*	Pre-test *M* (*SD*)	Post-test *M* (*SD*)
WISC – LDSF	28	5.39 (1.031)	5.96 (1.036)	23	5.61 (1.076)	5.87 (.968)	24	6.96 (1.233)	6.25 (1.113)	23	6.13 (1.576)	5.96 (1.261)
WISC – DSF	28	7.86 (1.799)	8.79 (1.641)	23	8.22 (1.704)	8.52 (1.534)	24	10.67 (2.297)	9.33 (2.036)	23	9.35 (2.639)	8.87 (2.096)
WISC – LDSB	28	3.64 (.621)	3.79 (1.031)	23	3.61 (.891)	3.87 (.757)	24	3.67 (.868)	4.08 (1.100)	23	4.09 (.900)	3.96 (1.065)
WISC – DSB	28	6.21 (1.197)	6.68 (1.611)	23	6.39 (1.530)	6.91 (1.676)	24	6.71 (1.488)	7.33 (1.494)	23	7.22 (1.594)	7.26 (1.815)
Stroop Task – Accuracy	27	36.85 (1.748)	37.52 (1.649)	23	37.09 (2.275)	37.57 (1.754)	24	37.75 (1.260)	36.84 (1.523)	23	37.91 (1.083)	36.43 (3.116)
Stroop Task – Response Cost	27	152.55 (178.068)	138.87 (152.638)	21	134.70 (131.793)	165.21 (112.738)	24	152.59 (92.614)	92.16 (133.327)	23	127.51 (77.480)	87.79 (164.715)
DCCS – Border	28	9.32 (1.744)	10.36 (1.660)	22	9.91 (1.900)	10.05 (1.704)	24	10.96 (1.429)	11.04 (1.301)	23	10.39 (1.828)	11.09 (1.276)

Note. WISC = Wechsler Intelligence Scale for Children (WISC-IV) – Digit Span Subtest; WISC – LDSF = length of sequence reported for the forward portion; WISC – DSF = number of trials correct for the forward portion; WISC – LDSB = length of sequence reported for the backward portion; WISC – DSB = number of trials correct for the backward portion; WISC – Total Raw Score = computed as the sum of DSF and DSB for the total raw score; Stroop Task = starfish task performed on a laptop computer; Stroop Task – Accuracy = number of incongruent and congruent trials correct; Stroop Task – Response Cost = computed by subtracting the average reaction times on congruent trials from average reaction time on incongruent trials, yielding a score that represents the response cost corrected for general reaction time; DDCS = Dimensional Change Card Sort; DCCS – Border = number of trials correct on the border phase.

Table 5
Pre- and Post-Test Mean Differentials and Standard Deviations by Condition (Mindful Me!, Control) and Age Group (Younger, Older) for the BRIEF

	Younger				Older			
	Mindful Me!		Control		Mindful Me!		Control	
Variable	*n*	Pre/Post Mean Differential (*SD*)	*n*	Pre/Post Mean Differential (*SD*)	*n*	Pre/Post Mean Differential (*SD*)	*n*	Pre/Post Mean Differential (*SD*)
Inhibit	10	-1.40 (7.199)	9	-.44 (4.613)	10	.00 (4.899)	12	1.08 (4.944)
Shift	10	-5.40 (3.565)	9	1.00 (3.674)	10	1.10 (4.771)	12	-.17 (3.996)
Emotional Control	10	-3.90 (10.734)	9	-.22 (4.549)	10	-3.90 (5.021)	12	-1.83 (6.088)
Initiate	10	2.10 (3.695)	9	-3.78 (5.563)	10	-1.00 (6.128)	12	-2.00 (5.641)
Working Memory	10	.80 (4.367	9	-.33 (6.745)	10	-4.00 (8.151)	12	1.92 (4.055)
Plan/Organize	10	-.70 (5.870)	9	-1.44 (5.077)	10	.00 (5.228)	12	.92 (4.078)
Organization of Materials	10	1.10 (5.953)	9	-2.11 (3.822)	10	1.70 (2.983)	12	-1.50 (5.161)
Monitor	10	.10 (6.385)	9	-.44 (6.002)	10	-2.50 (5.212)	12	.58 (4.337)
BRI	10	-3.80 (6.713)	9	.00 (4.416)	10	-1.60 (3.471)	12	-.42 (3.450)
MI	10	.30 (4.029)	9	-1.78 (2.682)	10	-1.40 (4.671)	12	.17 (2.623)
GEC	10	-1.40 (4.766)	9	-1.00 (2.449)	10	-1.60 (4.142)	12	.25 (2.379)

Note. Smaller sample size (*n*) for the BRIEF due to limited returned pre- and post-test BRIEFS from parents. BRI = Behavioural Regulation; MI = Metacognition; GEC = Global Executive Composite.

Table 6

Pre- and Post-Test Means and Standard Deviations for Emotional Regulation and Mindful Attention

	Younger						Older					
	Mindful Me!			Control			Mindful Me!			Control		
Variable	*n*	Pre-test *M* (*SD*)	Post-test *M* (*SD*)	*n*	Pre-test *M* (*SD*)	Post-test *M* (*SD*)	*n*	Pre-test *M* (*SD*)	Post-test *M* (*SD*)	*n*	Pre-test *M* (*SD*)	Post-te *M* (*SL*
MAAS – C	28	72.37 (11.255)	74.07 (12.593)	23	67.85 (9.646)	65.42 (15.789)	24	57.25 (10.820)	58.73 (11.825)	22	60.40 (10.530)	63.27 (10.072
MASQ – AA	28	17.75 (5.275)	18.28 (6.901)	23	20.74 (8.750)	21.17 (10.268)	24	20.58 (6.858)	18.04 (6.369)	23	17.17 (6.665)	16.17 (5.622)
RI – Total	28	52.46 (6.434)	51.88 (7.743)	22	50.58 (8.450)	48.17 (10.072)	24	48.29 (6.366)	46.92 (8.335)	23	49.67 (7.418)	51.22 (6.075)
RI – Optimism	28	34.50 (4.405)	32.78 (6.137)	23	32.02 (6.499)	31.39 (7.451)	24	31.45 (4.450)	30.17 (6.097)	23	32.06 (5.363)	33.22 (4.101)
RI – Emotional Control	28	18.92 (2.567)	18.88 (2.579)	22	16.81 (4.087)	17.05 (4.039)	24	16.75 (3.802)	16.75 (3.802)	23	18.00 (2.923)	18.00 (2.923)
CRSQ – RSR	28	19.36 (6.314)	18.91 (5.857)	23	22.15 (6.288)	22.04 (7.021)	24	23.96 (5.706)	21.21 (7.313)	23	19.24 (5.943)	17.65 (5.201)

Note. MAAS – C = Mindful Attention Awareness Scale for Children; MASQ – AA = Mood and Anxiety Symptom Questionnaire – Anxiety Arousal; RI = Resiliency Inventory; RI – Total = composite score across all items; RI – Optimism = composite score across items 1-9 only; RI – Emotional Control = composite score across items 10-14 only.

Table 7

Pre- and Post-Session Blood Pressure Data Reported as Means and Standard Deviation in Condition (Mindful Me!, Control) and Age Group (Younger, Older)

	Younger						Older					
	Mindful Me!			Control			Mindful Me!			Control		
Variable	*n*	Pre *M* (*SD*)	Post *M* (*SD*)	*n*	Pre *M* (*SD*)	Post *M* (*SD*)	*n*	Pre *M* (*SD*)	Post *M* (*SD*)	*n*	Pre *M* (*SD*)	Post *M* (*SD*)
Week 2												
Systolic	20	92.70 (10.423)	92.10 (7.355)	3	97.67 (21.079)	107.67 (23.159)	16	108.50 (18.232)	114.56 (13.451)	16	101.94 (7.407)	101.38 (11.529)
Diastolic	20	66.55 (10.655)	65.65 (5.887)	3	63.67 (10.116)	80.67 (19.399)	16	72.44 (12.707)	75.25 (17.763)	16	63.44 (5.645)	63.63 (16.157)
Pulse	20	83.20 (12.408)	78.65 (13.007)	3	73.67 (11.930)	84.00 (14.799)	16	73.63 (14.018)	80.56 (17.347)	16	68.44 (11.639)	68.69 (13.519)
Week 6												
Systolic	15	95.53 (11.667)	94.67 (12.647)	8	97.75 (16.697)	106.63 (19.198)	19	104.79 (10.092)	100.89 (9.888)	18	111.11 (13.087)	107.33 (12.916)
Diastolic	15	64.53 (15.501)	67.47 (13.974)	8	69.88 (16.427)	87.38 (22.709)	19	65.47 (8.442)	65.89 (6.624)	18	70.39 (15.583)	68.67 (11.931)
Pulse	15	86.40 (10.466)	85.67 (12.505)	8	83.50 (12.479)	87.13 (23.148)	19	76.32 (9.393)	77.63 (8.604)	18	77.72 (12.063)	75.72 (12.063)
Week 8												
Systolic	11	101.36 (15.964)	97.73 (14.506)	14	93.43 (14.945)	92.79 (14.322)	24	101.42 (12.395)	97.88 (9.023)	14	106.64 (12.150)	105.86 (9.189)
Diastolic	11	69.18 (19.808)	67.64 (13.618)	14	60.07 (5.342)	61.86 (7.167)	24	66.33 (11.347)	65.04 (7.025)	14	74.36 (16.704)	73.21 (13.069)
Pulse	11	84.64 (12.011)	83.45 (15.062)	14	86.64 (15.795)	88.14 (14.405)	24	73.96 (13.930)	76.54 (11.294)	14	82.14 (26.935)	79.93 (8.109)

Note. Smaller sample size (*n*) for week 2 for the younger participants from the active control condition due to error from the blood pressure machine. Systolic = (upper number) indicates how much pressure the blood is exerting against the artery walls when the heart beats; Diastolic = (lower number) indicates how much pressure is exerting against artery walls while the heat is resting between beats.

Table 8
Average Grades and Standard Deviations by Condition (Mindful Me!, Control) and Age Group (Younger, Older)

	Younger				Older			
	Mindful Me!		Control		Mindful Me!		Control	
Weeks	*n*	Average Grade (*SD*)	*n*	Average Grade (*SD*)	*n*	Average Grade (*SD*)	*n*	Average Grade (*SD*)
Week 1	24	3.089 (.792)	23	2.893 (.696)	21	3.256 (.821)	22	3.298 (.378)
Week 3	27	2.580 (.912)	22	2.915 (.645)	23	3.278 (.752)	22	3.426 (.809)
Week 5	28	3.263 (.702)	23	3.110 (.844)	12	3.656 (.233)	14	3.367 (.211)
Week 7	27	3.028 (.606)	23	3.212 (.273)	20	3.259 (.837)	19	3.289 (.315)

Note. Smaller sample size (*n*) for week 5 for the older participants from both conditions (Mindful Me!, control) due to children having prior school commitments (school concert). Journals were grades based from the Ministry of Education Ontario Curriculum. Participants received a grade from levels 1 to 4, with 1 being a low grade and 4 being a high grade.

Appendix A

Mindful Attention Awareness Scale for Children

Please circle the number that best answers each statement. Please answer honestly and ask any questions if you do not understand any of the statements. Your responses will be kept confidential, and only the researchers, not the teachers, parents, and principal will see your completed answers.

	Almost never	Not very often at all	Not very often	Somewhat often	Very often	Almost always
I could be feeling a certain way and not realize it until later	1	2	3	4	5	6
I break or spill things because of carelessness, not paying attention, or thinking of something else	1	2	3	4	5	6
I find it hard to stay focused on what's happening in the present moment	1	2	3	4	5	6
Usually, I walk quickly to get where I'm going without paying attention to what I experience along the way	1	2	3	4	5	6
Usually, I do not notice if my body feels tense or uncomfortable until it gets really bad	1	2	3	4	5	6
I forget a person's name almost as soon as I've been told it for the first time	1	2	3	4	5	6
It seems that I am doing things automatically without really being aware of what I am doing	1	2	3	4	5	6
I rush through activities without being really attentive to them	1	2	3	4	5	6
I focus so much on a future goal I want to achieve that I don't pay attention to what I am doing right now to reach it	1	2	3	4	5	6
I do jobs, chores, or schoolwork automatically without being 1 aware of what I'm doing	1	2	3	4	5	6
I find myself listening to someone with one ear, doing something else at the same time	1	2	3	4	5	6
I walk into a room, and then wonder why I went there	1	2	3	4	5	6
I can't stop thinking about the past or the future	1	2	3	4	5	6
I find myself doing things without paying attention	1	2	3	4	5	6
I snack without being aware that I'm eating	1	2	3	4	5	6

Appendix B
WISC – IV Digit Span Subtest – Forward and Backward Portion

3. Digit Span

Start
Ages 6–16:
Forward: Item 1
Backward: Sample, then Item 1

Discontinue
Forward: After scores of **0** on *both trials* of an item
Backward: After scores of **0** on *both trials* of an item

Score
Score **0** or **1** point for each trial
DSF & DSB
Total Raw Score for DS Forward and Backward, respectively
LDSF & LDSB
Number of digits recalled on last trial scored 1 point for DS Forward and Backward, respectively

Forward

Trial		Response	Trial Score	Item Score
6–16 ▶ 1.	2 – 9		0 1	0 1 2
	4 – 6		0 1	
2.	3 – 8 – 6		0 1	0 1 2
	6 – 1 – 2		0 1	
3.	3 – 4 – 1 – 7		0 1	0 1 2
	6 – 1 – 5 – 8		0 1	
4.	8 – 4 – 2 – 3 – 9		0 1	0 1 2
	5 – 2 – 1 – 8 – 6		0 1	
5.	3 – 8 – 9 – 1 – 7 – 4		0 1	0 1 2
	7 – 9 – 6 – 4 – 8 – 3		0 1	
6.	5 – 1 – 7 – 4 – 2 – 3 – 8		0 1	0 1 2
	9 – 8 – 5 – 2 – 1 – 6 – 3		0 1	
7.	1 – 8 – 4 – 5 – 9 – 7 – 6 – 3		0 1	0 1 2
	2 – 9 – 7 – 6 – 3 – 1 – 5 – 4		0 1	
8.	5 – 3 – 8 – 7 – 1 – 2 – 4 – 6 – 9		0 1	0 1 2
	4 – 2 – 6 – 9 – 1 – 7 – 8 – 3 – 5		0 1	

Backward

Trial		Response	Trial Score	Item Score
6–16 ▶ S.	8 – 2			
	5 – 6			
1.	2 – 1		0 1	0 1 2
	1 – 3		0 1	
2.	3 – 5		0 1	0 1 2
	6 – 4		0 1	
3.	5 – 7 – 4		0 1	0 1 2
	2 – 5 – 9		0 1	
4.	7 – 2 – 9 – 6		0 1	0 1 2
	8 – 4 – 9 – 3		0 1	
5.	4 – 1 – 3 – 5 – 7		0 1	0 1 2
	9 – 7 – 8 – 5 – 2		0 1	
6.	1 – 6 – 5 – 2 – 9 – 8		0 1	0 1 2
	3 – 6 – 7 – 1 – 9 – 4		0 1	
7.	8 – 5 – 9 – 2 – 3 – 4 – 6		0 1	0 1 2
	4 – 5 – 7 – 9 – 2 – 8 – 1		0 1	
8.	6 – 9 – 1 – 7 – 3 – 2 – 5 – 8		0 1	0 1 2
	3 – 1 – 7 – 9 – 5 – 4 – 8 – 2		0 1	

LDSF Max = 9

Digit Span Forward (DSF) Total Raw Score (Maximum = 16)

LDSB Max = 8

Digit Span Backward (DSB) Total Raw Score (Maximum = 16)

Total Raw Score (Maximum = 32)

Appendix C

Mood and Anxiety Symptom Questionnaire – Anxious Arousal

Below is a list of feelings, sensations, problems, and experiences that people sometimes have. Read each item and then fill in the blank with the number that best describes how much you have felt or experienced things this way during the past week, including today. For this one, all you have to do is write down the number that BEST reflects the statement.

1	2	3	4	5
not at all	a little bit	moderately	quite a bit	extremely

________1. Was short of breath

________2. Felt dizzy or lightheaded

________3. Hands were cold or sweaty

________4. Hands were shaky

________5. Had trouble swallowing

________6. Had hot or cold spells

________7. Felt like I was choking

________8. Muscles twitched or trembled

________9. Was trembling or shaking

________10. Had a very dry mouth

Appendix D

Children's Response Styles Questionnaire – Rumination Scale Revised

We are interested in what you are like. The following items ask you questions about how you feel. When people feel sad, they do and think different things. What about you – what do you do and think when you are sad? For each question, please indicate what you usually do, not what you think you should do.

	Almost never	Sometimes	Often	Almost always
1. When I am sad, I think about a recent situation wishing it had gone better.	1	2	3	4
2. When I am sad, I think: "Why can't I handle things better?"	1	2	3	4
3. When I am sad, I think: "Why do I always react this way?"	1	2	3	4
4. When I am sad, I think: "Why do I have problems other don't have?"	1	2	3	4
5. When I am sad, I think: "What am I doing to deserve this?"	1	2	3	4
6. When I am sad, I go away by myself and think about why I feel this way.	1	2	3	4
7. When I am sad, I go someplace alone to think about my feelings.	1	2	3	4
8. When I am sad, I think about recent events to try to understand why I feel this way.	1	2	3	4
9. When I am sad, I write down what I am thinking and try to understand these thoughts.	1	2	3	4
10. When I am sad, I reflect on myself to try to understand why I am depressed.	1	2	3	4

Appendix E
Resiliency Inventory

For each sentence, indicate how well it describes you by circling the number that describes how true it is for you.

About me…	**Not at all like me**	**A little bit like me**	**Kind of like me**	**A lot like me**	**Always like me**
1. I have more bad times than good.	1	2	3	4	5
2. More good things than bad things will happen to me.	1	2	3	4	5
3. I start most days thinking I'll have a bad day.	1	2	3	4	5
4. Even if there are bad things, I'm able to see the good things about me and my life.	1	2	3	4	5
5. I'm bored by most things in life.	1	2	3	4	5
6. I think things will get worse in the future.	1	2	3	4	5
7. I am optimistic about school life.	1	2	3	4	5
8. I think that I am a lucky one.	1	2	3	4	5
9. When something bad happens to me, I think that it will last long.	1	2	3	4	5
10. Even little things make me upset.	1	2	3	4	5
11. I keep making the same mistakes over and over.	1	2	3	4	5
12. I get impatient when I have to wait for something.	1	2	3	4	5
13. I make decisions before I have a chance to think about the consequences.	1	2	3	4	5
14. I stay calm even when there's a crisis.	1	2	3	4	5

Appendix F
Rubric for Grades 2 to 4

Criteria	**Level 4**	**Level 3**	**Level 2**	**Level 1**
Knowledge and Understanding • Journal entry is about the topic	-Writes about the topic throughout the journal entry topic	-Writes some points about the journal entry topic	- Writes insufficient points about the journal entry topic	- Does not write about journal entry topic
Thinking • Creative	-Uses own creativity to write about the topic	- Uses limited creativity to write about the topic	- uses very limited creativity to write about the topic	- does not use creativity to write about the topic
Communication • Includes topic in journal	-Gathers information about the topic effectively	- Gathers a few information about the topic effectively	- Gathers insufficient information about the topic effectively	- Does not gather any information about the topic effectively
Application • Does not include spelling and grammar mistakes	-Edits work, corrects mistakes	-Missed a few edits and has a few spelling mistakes that have not been corrected	- Missed some edits and has some spelling mistakes that have not been corrected	- Missed edits and words are not readable

Appendix G
Rubric for Grades 7 to 8

Criteria	**Level 4**	**Level 3**	**Level 2**	**Level 1**
Knowledge and Understanding • Topics • Information and ideas	- deals with topics with a high degree of depth and understanding - work includes high degree of information and ideas that show a developed understanding of topics	- deals with topics with considerable depth and understanding - work includes a lot of important information and ideas that show understanding of topics	- deals with topics with some depth and understanding - work includes some important information and ideas that develop their own understanding	- deals with topics with limited depth and understanding - shows limited understanding of topic, information, and ideas
Thinking • Creativity • Knowledge • Making connections personally or with your experiences	- takes an in depth exploration of topics with knowledge received from class - entries show a high risk to explore topics to show an understanding of topics	- explores topics to show a lot of knowledge that is received from class - entries show a lot more risks with topics and ideas	- explores topics with some knowledge received from class - entries show some risks with topics and ideas	- explores topics with limited knowledge received from class - entries show limited risks with topics and ideas
Communication • Final copy • Uses topic effectively to communicate ideas	- topics and ideas are very clear and understandable	- topics and ideas are clear and understandable	- topics and ideas are clear somewhat	- topics and ideas are not clear or readable
Application • Grammar, spelling, sentence, etc. • clarity	- journal entry does not have grammar or spelling mistakes	- journal entry has a few spelling and grammar mistakes	- journal entry has many grammar and spelling mistakes	- journal entry is not readable due to a number of grammar and spelling mistakes