Feasibility Study: Can Mindfulness Practice Benefit Executive Function and Improve Academic Performance?

Zsuzsanna Grandpierre, B. A. Hon.

June 10, 2013

Thesis submitted to the Faculty of Graduate and Postdoctoral Studies

In partial fulfilment of requirements for the

Masters of Art in Educational Counselling degree

Faculty of Education

University of Ottawa

Dedication

This thesis is dedicated to all those people who believe that due to their learning disability they cannot accomplish higher education.

"Come, come, whoever you are. Wanderer, worshiper, lover of leaving. It doesn't matter. Ours is not a caravan of despair. Come, even if you have broken your vows a thousand times. Come, yet again, come, come."— Rumi

Acknowledgment

First and foremost, I like to express my most heartfelt gratitude to my husband Dean, who believed in me. Your unrelenting support and encouragement throughout my education allowed me to accomplish one of my life long desires. Without you none of this could have ever happened. I am lucky to have found you. You make me whole and I love you.

I am grateful for the expertise, support, and unwavering patience of my supervisor, Dr. Diana Koszycki. I appreciate your mentorship and the opportunity to learn from you. I am thankful for the thoughtful feedback of Dr. Cary Kogan and Dr. David Trumpower, who were on my committee. Dr. Kogan, your insistence on including an ADHD scale was career altering. I am now providing mindfulness-based interventions for the treatment of ADHD. Dr. David Smith your feedback and guidance at the beginning stages of this thesis was instrumental.

I like to thank my children for their contribution to my education. Vivi, it was a true privilege to take classes with you and prepare for exams together. Your humour (and stretch…) made going to school so much fun. Zsofi, you throw the greatest pity parties; made me feel better every time. Bence, your hugs are the best thing in this world. Your timing is impeccable.

I want to acknowledge the Ontario Graduate Scholarship Program and the Social Science Humanities Research Council for funding this research. Special thanks go to Larry McCloskey, Dr. John A. Meissner, Jessie Gunnell and Sonia Tanguay at the Paul Menton Center for Students with Disabilities at Carleton University, where this research was allowed to take place. I am also grateful for all the students who participated in this study.

Finally, I need to recognize my late father, who set with me under the apricot tree day-after-day and year-after-year, determined to teach me how to read. Thank you!

Abstract

The purpose of this research was to establish the feasibility of delivering a 6-week long adapted Mindfulness for Academic Success (MAS) program to post-secondary students who were experiencing difficulties with their academic performance. Feasibility was established based on recruitment success (70%), program attendance (70% of participants attending at least four sessions), and homework compliance (70% homework completed). In addition, we hoped to establish the MAS program's preliminary efficacy in improving executive and academic functioning and reducing mind wandering, inattention, symptoms of ADHD, and psychological distress.

Forty participants from Carleton University were randomized to the MAS program (n = 20) or waitlist (WL) condition (n = 20). The overall dropout rate in this study was 38 %. Forty-five percent of the MAS program and 80% of the WL condition participants completed the study. MAS program completers complied with 32% of the overall homework during the five week reporting period and no student completed individually more than 57% of the assigned homework tasks. Accordingly, we did not meet the session attendance or homework completion feasibility requirements.

Our preliminary efficacy results indicated significant improvements in some program outcomes in the intent-to-treat sample and results were more robust for MAS completers. Specifically *executive functioning—self-management to time, self-organization, self monitoring, self-regulation of emotions,* and *executive function (EF) related ADHD symptoms*—improved and *ADHD* symptoms decreased in the intent-to-treat sample and results were more robust in the completer sample. *Psychological distress* symptoms (*depression* and *stress*) and *mind wandering* decreased only in MAS program completers, but no changes were noted in students' ability to

pay *attention* to presented information during the mind wandering task. *Academic functioning* as measured by *selecting main ideas, the use of study aids,* and *time management* improved in both the intent-to-treat and completer samples. Changes in *concentration* and *information processing* were only evident for MAS program completers, however, changes were also noted in *academic anxiety, motivation,* and the use of *test strategies,* although effects were small. No changes were observed in participants' *self-restraint* (EF), *generalized anxiety, attitude* toward school*,* and the use of *self-testing* in exam preparation.

Although efficacy results suggest the MAS program may be beneficial, low program compliance and lack of change in students' levels of *mindfulness* compromise the internal validity of this study and make drawing causal conclusions about the program's efficacy difficult. Furthermore, while program attendance and homework compliance were correlated with some program outcomes, the lack of correlation between formal practices of mindfulness and program outcomes suggest that non-specific factors may have contributed to observed improvement in study outcomes.

Table of Contents

List of Tables

List of Figures

Glossary of Terms

Attention: the ability to focus on the present moment (task at hand)

Focus: directing attention onto a single task

Concentration: effortful maintenance of attention on a single task

Informal mindfulness practice: maintaining awareness on performing any daily task

Meditation: technique used to train or calm the mind. Meditation can take the form of devotional contemplation, concentration, or awareness practice

Mindfulness: paying attention in a particular way; on purpose, in the present moment, and non-judgmentally

Mindfulness meditation: formal practice of mindfulness, which may include the body scan, and sitting or walking meditation

Mindfulness practice: refers to both formal and informal practice of mindfulness

Introduction

Despite steadily increasing post-secondary enrolment, graduation rates do not parallel this rise. According to Statistics Canada, one out of seven students do not complete post-secondary education (Shaienks, Gluszynski, & Bayard, 2005), and these numbers may be as high as one in five (Wintre, Bowers, Gordner, & Lange, 2006). The rate of post-secondary dropout in Canada is comparable to other countries in the industrialized world. In the United States, one in four students (Hamilton & Hamilton, 2006) and in the European Union countries one in six students fail to graduate (European Union Life Long Learning Program, 2010).

A report commissioned by Human Resources and Social Development Canada (HRSDC) suggests that poor academic performance, measured by grade point average (GPA) is one of the most common reasons for dropping out from post-secondary education (Ma & Frempong, 2008). Although GPA is used to determine suitability for post-secondary education, research indicates that academic functioning (e.g., attitudes, motivation, learning skills) is a more robust predictor of academic difficulties during post-secondary education (Kern, Fagley, & Miller, 1998; Weinstein, Schulte, & Palmer, 1987). Nonetheless, because academic performance is critically influenced by the effectiveness of executive function (EF; planning, self-monitoring, and cognitive flexibility) processes (Biederman et al., 2003; Meltzer, Sales Pollica, & Barzillai, 2007), most post-secondary retention programs focus on improving EF-controlled skills, such as time or task management, with the hope of improving grades (Campbell & Campbell, 2007; Engle, Reilly, & Levine, 2003; Scott & Homant, 2007). A meta-analysis examining the effectiveness of 14 retention programs for students on academic warning found that programs varied from d = - 0.16 to 0.56 (averaging to d = 0.20) effect size, preventing on average 30% of program participants from dropping out (Thompson, 2010). The variation in effect size is due to

different program implementations (e.g., focus, individual or group session, frequency of meetings, education of facilitators) and student characteristics (e.g., students' academic status and age).

Whereas empirical research is needed to identify retention related best-practice components, none of the interventions has looked at the benefits of enhancing self-regulation, the primary function of EF (Barkley, 2001, 2011), or directed attention, which is hypothesized to have a governing function over all EF processes (Kaplan & Berman, 2010; Wiebe, Espy, & Charak 2008) in addition to teaching academic skills. This is interesting because self-regulation is critical for goal attainment (Barkley, 2001, 2011) and the ability to evoke, focus, and maintain attention has long been known to be an essential component of learning (Mulligan, 1998; Smallwood, Fishman, & Schooler, 2007; Stadler, 1995).

Psychological distress is also hypothesized to contribute to poor academic performance and increased risk of dropout (Andrews & Wilding, 2004; Eisenberg, Golberstein, & Hunt, 2009; Kennett & Reed, 2009; Sheilds, 2001; Weinstein & Palmer, 2002). This is due, in part, to the effect of negative emotions on cognitive functioning (Cohen & Weinstein 1981; MacDonald & Lubuc, 1982; Rohrmann, Hennig, & Netter, 1999; Weinstein & Palmer, 2002) and health behaviours (Weider, Kohlman, Dotzauer, & Burns, 1996). Yet, retention programs in general do not address students' mental health or teach coping strategies (Campbell & Campbell, 2007; Engle et al., 2003; Polansky, Horan, & Hanish, 1993; Scott & Homant 2007).

Whereas self-regulatory and attention training can take many forms, mindfulness-based interventions offer a multifaceted approach to improve global executive functioning processes (Flook et al., 2010; Teasdale, 1999; Wells, 2002; Zeidan, Johnson, Diamond, David, & Goolkasian, 2010). The practice of mindfulness increases the ability to regulate thoughts,

behaviours, and emotions, and enhances the capacity to sustain attention in the present moment (Baumeister, Gailliot, DeWall, & Oaten, 2006; Kabat-Zinn, Lipworth, & Burney, 1985; Reid, Trout, & Schartz, 2005; Shapiro & Schwartz, 1999, 2000). In addition, mindfulness-based interventions have been shown to reduce negative emotions (Baer, 2003; Kabat-Zinn, 1990, Teasdale, 1999). Therefore, the above-mentioned benefits indicate that the practice of mindfulness may prove to be a beneficial intervention for improving students' academic success.

Academic Performance and Academic Functioning

Academic performance, measured by grades or GPA, indicates the success to which students reach standardized or institutionally defined educational expectations. Academic evaluation is generally performed through verbal or written examinations and completion of individual or team assignments. In an effort to ensure that students are adequately prepared for post-secondary education, university admissions are granted based on students' high school GPA or standardized achievement test (SAT) scores. Furthermore, GPA and SAT scores are believed to predict future academic success and are therefore used as retention indicators. However, in addition to students' self-regulation, directed attention, and mental health (Biederman et al., 2003; Meltzer et al., 2007) academic performance is influenced by academic functioning related factors, such as attitudes, motivation and learning skills (Kern, Fagley, & Miller, 1998; Weinstein, Schulte, & Palmer, 1987). Recognizing the role of academic functioning in academic performance, the Ontario Ministry of Education (2013) requires that secondary-school teachers provide a letter grade (E - Excellent, G - Good, S - Satisfactory, N - Needs improvement) in addition to number grades on report cards to indicate the quality of students' learning skills and work habits. Additionally, in post-secondary education academic functioning has been found to better predict academic difficulties than GPA (Kern et al., 1998; Weinstein et al., 1987).

Academic functioning can be assessed with a variety of measures, such as the Academic Competence Evaluation Scales-College (ACES-College; DiPerna & Elliott, 2001), or the Motivated Strategies for Learning Questionnaire (MLSQ; Pintrich, McKeachie, & Smith, 1989). However, the most popular measure of academic functioning is the Learning and Study Strategies Inventory (LASSI; Weinstein et al., 1987; Everson, Weinstein, & Laitusis, 2000). The LASSI investigates students' awareness of their learning strategies, motivation, and self-regulation by inquiring about covert and overt academic related thoughts, behaviours, attitudes, and beliefs (Weinstein et al., 1987). This scale has been used successfully to predict post-secondary retention (Felder, Forrest, Baker-Ward, Dietz, & Mohr, 1993; Thompson, 2011). Therefore, it appears that investigating student's academic functioning provides the best risk assessment for preventing post-secondary attrition.

Executive Functions and Academic Functioning

Academic functioning is influenced by health behaviours (e.g., physical activity, diet, sleep), health-related variables (e.g., social support, religiosity), the number of hours worked or volunteered during the academic year (Trockel, Barnes, & Egget, 2000), academic and social motivation (Wentzel & Wigfield, 1998), intelligence (Elshout & Veenman, 1992; Sternberg & Kaufman, 1998), and psychological distress (Andrews & Wilding, 2004; Eisenberg et al., 2009; Kennett & Reed, 2009; Sheilds, 2001; Weinstein & Palmer, 2002). In addition to playing a significant role in the above-mentioned aspects, EF has emerged as not only having critical influence on academic functioning (Biederman et al., 2004; Best, Miller, & Naglieri, 2011), but also as the most easily and effectively manipulated cognitive process that can improve retention (Campbell & Campbell, 2007; Engle et al., 2003; Scott & Homant, 2007).

There are marked individual differences in EF and it is activated primarily in novel or complex situations (Suchy, 2009). It supervises cognitive activities, such as planning and executing action, problem solving, causal attributions, and the capacity to control emotions and behaviour (Suchy, 2009). Furthermore, EF regulates behaviour by allowing people to consider their options and select their responses based on situational factors, prior experiences, and future goals.

Due to its multifaceted nature, over time EF has been defined based on its role (e.g., problem solving or planning and organizing action; Denckla, 1996; Morris, 1996; Wells & Pennington, 1988), according to its components (e.g., regulation, execution, and social discourse; Dennis, 1991), or as a process (e.g., information processing; Borkowski & Burke, 1996). These complex cognitive processes have often been referred to as *frontal lobe functions* (Stuss & Alexander, 2000). However, the lack of agreement on unitary or diverse function of the frontal lobe created much debate about its EF connections.

Stuss and Alexander (2000) suggested that some of the confusion regarding the role of the frontal lobe might be due to testing methodology. When frontal or executive functions are tested by complex tasks, multiple functions are activated and the frontal lobe appears to have a homogenous function. When simple tasks are used, different regions of the frontal lobe are activated, indicating diverse functions. The debate about the role of the frontal lobe in EF is further complicated by the limited availability of patients with specific frontal lobe damage, issues with frontal-function test sensitivity, and by the inability to adequately operationalize what we interchangeably call *executive*, *supervisory,* or *frontal* functions. There is also a lack of agreement on whether EF is a single psychological construct (central attention system; Eslinger, 1996; Kaplan & Berman, 2010) or a combination of separate components (e.g., working

memory, response inhibition, and shifting attention; Miyake et al., 2000). In addition, the validity of EF testing has been threatened by being either too complex or not comprehensive enough to measure global executive functioning (Barkley, 2011). Accordingly, EF tests have low validity and reliability (Barkley & Murphy, 2011; Stuss & Alexander, 2000).

In an effort to improve global EF neuropsychological testing—as it may most likely relate to academic functioning—Barkley (2001) investigated the development and benefit of EF from an evolutionary perspective. He proposed that behavioural inhibition, self-regulation, and executive functioning are inherently interconnected to ensure adaptive behaviour and should not be considered separately when investigating global executive functioning.

Barkley (2001) argued that EF signifies five major covert self-directed actions that regulate overt future oriented social behaviours. *Self-inhibition* represents delaying response, inhibiting action, and protecting oneself from distractions. In an effort to determine the right course of action a person must engage in evaluation (weighing pros and cons) and be able to modify his/her action. The ability to inhibit and modify behaviour can be considered as the core processor of self-regulation. *Nonverbal working memory* represents self-directed sensory-motor actions. This EF allows one to consider past experiences (retrospection) to hypothesize about potential future outcomes (prospection) and relies on mental imagery and auditions for making decisions. *Verbal working memory* refers to self-directed speech, which permits covert self-reflection, self-instruction or questioning, and ability to develop rules for self-regulation. *Self-regulation of affect and motivation* reflects the ability to keep emotions and these motivations private. This EF is the source of willpower which is needed for future-oriented behaviour. Finally, *self-directed play or reconstitution* (flexibility) promotes the generation of new behaviour that meets the demand of current circumstances based on past experiences.

These five EFs facilitate adaptive behaviour, allowing for covert reflection of potential behavioural outcomes while avoiding overt expressions of trial and error behaviour. The benefit of this process is to foster consideration of long-term social consequences of behaviour rather than being over focused on immediate outcomes. Based on this evolutionary perspective Barkley (2011) redefined EF as a metaconstruct and offered the following definition: "self-regulation across time for the attainment of one's goals (self-interest), often in the context of others" (p. 13). Barkley's effort in redefining EF culminated in the development of the Barkley Deficits in Executive Functioning Scale-Long Form (BDEFS-LF), which assesses how impairments in *self-management, self-organization, self-motivation, self-restraint,* and *self-regulation of emotions* affect goal attainment, such as completing post-secondary education.

Accordingly, EF deficits can be characterised by low levels of self-regulation in behaviour inhibition, working memory, motivation, and in motor control, often resulting in serious behavioural and social impairments comparable to those seen in *attention deficit hyperactive disorder* (ADHD). It is therefore not surprising that this developmental neuropsychiatric disorder marked by age inappropriate inattention, impulsivity and/or hyperactivity has been associated with low academic functioning (Biederman et al., 2004). Academic success requires that students are able to regulate themselves to manage their time, prioritize tasks, problem solve, and monitor progress. The inability to successfully perform these tasks reflects poor self-regulatory functions and accordingly has been attributed to EF deficits (Meltzer et al., 2007).

Self-regulation can be improved through a variety of interventions (Baumeister et al., 2006; Kabat-Zinn et al., 1985; Reid et al., 2005; Shapiro & Schwartz, 1999, 2000) which have been extensively investigated in ADHD research (Reid et al., 2005). It is now believed that the

conscious practice of *self-monitoring, self-reinforcement,* and *self-management* can significantly improve a person's ability to regulate their emotions and behaviours (Reid et al., 2005). These practices require that a person learn to view him or herself as self-as-context, rather than self-as-content. That is, develop third person awareness over one' thoughts, feelings, and behaviours. Through this awareness a person can engage in self-assessment and self-evaluation which are the fundamental building blocks of self-regulation (Pintrich, 2000; Reid et a., 2005; Zimmerman, 2000).

Self-monitoring interventions generally require a student to monitor attention or performance and maintain a progress record. These interventions can be also augmented with reinforcement strategies, where an external agent rewards good performances. *Self-reinforcement* training also involves a reward system but rewards are self-awarded when a predetermined target behaviour is performed to expectations. Finally, *self-management* exercises entail self-monitoring and rating of behaviour and comparing one's behaviour to socially accepted standards (Reid et al., 2005). Alternatively, the practice of mindfulness, through enhancing the ability to focus on the present moment (attention) and increasing the perception of thoughts, feelings and body sensations (awareness), has also been recognized to improve self-regulation (Kabat-Zinn et al., 1985; Shapiro & Schwartz, 1999, 2000). This is not surprising since mindfulness generates a self-as-context point-of view and increases the ability to observe one's experiences with some distance and disidentification (Teasdale et al., 2000). Accordingly, the practice of mindfulness makes use of the same process as the previously mentioned self-regulatory interventions.

However, self-regulation relies on limited energy resources and exertion may result in diminished capacity (Muraven & Baumeister, 2000). Self-regulation requires the exertion of

control over thoughts, feelings, and behaviours when inhibition is required to follow rules, achieve goals, and/or delay gratification. Therefore, self-control is strength dependent, with more difficult tasks requiring more self-regulatory resources than less difficult tasks. The exertion of self-control can reduce available resources on subsequent tasks and temporarily render self-regulatory attempts ineffective. Research indicates that during self-regulation blood glucose levels drop, suggesting that self-regulatory resources may be glucose dependent (Dvorak & Simons, 2009). Masicampo and Baumeister's (2008) research substantiated the role of glucose in self-regulation by showing that glucose consumption can replenish depleted self-regulatory resources and improve self-control. Muraven and Baumeister (2000) used the analogy of muscle exertion to explain how self-control resources—unlike working memory resources, which also have a limited capacity but are immediately available again after the completions of task—get depleted after use and require replenishment before the next self-control attempt.

This energy depleted self-regulatory state has been called ego-depletion (Baumeister, Bratslavsky, Muraven, & Tice, 1998), and in the case of students is often demonstrated by poor exam performance following last minute excessive efforts of studying. Temporarily depleted resources can be replenished not only through glucose consumption, but also through the practice of meditation and/or spending time in nature (Kaplan, 2001; Kaplan & Berman, 2010). For instance, meditation provides an opportunity to rest the mind from exertion, whereas spending time in nature induces *soft fascination* (Kaplan, 2001; Kaplan & Berman, 2010).

The capacity of self-regulatory resources can be strengthened through the consistent practice of self-regulation leading to increased self-control capacity over time (Muraven, Baumeister, & Tice; 1999; Reid et al., 2005). Furthermore, self-regulatory exercises have been shown to successfully improve academic functioning (Oaten & Cheng, 2006). Therefore,

regardless of the type of self-regulatory intervention, students must engage with these practices on a regular and long-term basis if they hope to improve their academic success.

Based on the important role of self-regulation for academic success it might be advantageous to consider enhancing retention program curricula with training that targets students' global executive functioning, rather than strictly focusing on specific EF-driven academic skills. Furthermore, these practices need to be combined with methods that may also protect student' self-regulatory resources from depletion and provide the opportunity for regular practice to improve this capacity.

The practice of mindfulness not only improves self-regulation of emotions and behaviour (Kabat-Zinn et al., 1985; Shapiro & Schwartz, 1999, 2000), but also replenishes self-regulatory resources by providing an opportunity to rest the mind from exertion (Kaplan, 2001). In addition, it provides the opportunity for regular (daily) practice of self-regulation, thus enhancing students' self-regulatory resource capacity.

Directed Attention and Academic Functioning

While there is disagreement about whether EF is a single or complex psychological construct (Eslinger, 1996; Miyake et al., 2000), it is commonly accepted that *directed attention* plays a pertinent role in orchestrating EF processes and in self-regulation (Kaplan & Berman, 2010; Wiebe, Espy, & Charak 2008). Furthermore, without attention there can be no intentional learning and increasingly complex learning requires even more attention (Schmidt, 1995). When students dedicate undivided attention to what they are learning, they are able to acquire and recall more information with greater accuracy (Mulligan, 1998; Smallwood et al., 2007). Consequently, improving students' ability to evoke, switch, and maintain their attention could also benefit all EF-driven skills and thus their academic functioning. In support of this idea,

ADHD research has long emphasized the importance of attention training to improve academic functioning (DuPaul, Guevremont, & Barkley, 1992; Kerns, Eso, & Thomson, 1999; Rabiner, Murray, Skinner, & Malone, 2010).

Attention, like EF, is believed to be a frontal lobe function (Norman & Shallice, 1986). Not surprisingly, the role of the frontal lobe in attention—just like its role in EF—is debated to be either supported globally or by particular frontal brain regions related to specific attention related functions, such as arousal, selective attention, or inhibition (Stuss, 2006). Similarly, as in the case of EF, simple tasks can be associated with specific regions, while increasingly complex tasks indicate homogenous frontal lobe activation and global attentional function (Stuss, 2006).

William James (1890) defined attention as "taking possession by the mind, in clear and vivid form, of one out of what seem several simultaneously possible objects or trains of thought. Focalization, concentration, of consciousness are of its essence. It implies withdrawal from some things in order to deal effectively with others, and is a condition which has a real opposite in the confused, dazed, scatterbrained state" (p. 403). James (1892) differentiated between involuntary attention, which automatically draws attention to important events, and voluntary attention, which requires conscious effort to direct attention to less interesting tasks.

Since James, attention theory has evolved. Today we recognize attention to be driven by five mechanisms (Wickens & McCarley, 2008). *Focused attention* refers to the ability to direct attention to a single environmental stimulus, *sustained attention* allows for continued focus on the task, and *selective attention* helps ignore distractions. *Switching attention* provides the mental flexibility to shift attention between tasks and *divided attention* facilitates the capacity to attend to multiple tasks simultaneously (Wickens & McCarley, 2008). Parallel processing implies that we are capable of attending equally to two or more simultaneous stimuli. However, Treisman

and Riley's (1964) research indicated that only information that is consciously attended to can be synthesized with existing knowledge, while unattended information is attenuated (dimmed) and we only occasionally register significant information from its content.

Because EF is activated by complex situations and its processes serve goal-directed behaviours, Kaplan and Berman (2010) suggest that EF relies on focused or directed attention. EF works best when people can switch the focus of their attention from one task to another and maintain their attention on the important task while ignoring distractions. Successful learning requires synthesizing incoming information with existing knowledge, and this process depends on the persistent focus of attention and the ability to select action that is in line with future goals.

Attention training can be approached from multiple angles and from ADHD research we know that attention training practices commonly entail *environmental modifications* (e.g., reducing noise), use of *external aids* (e.g., lists, schedules), *psychosocial support* (e.g., counselling, psycho-education), *self-regulatory strategies*, such as those covered in the previous section, and *attention process training* (Sohlberg & Mateer, 2001). *Attention process training* usually involves cognitive exercises commonly delivered through computer programs and requires the repetition of specific tasks with increasing difficulty. Each task is designed to improve one of the specific types of attention (sustained, selective, alternating, or divided). However, this type of attention training has been criticized for not generalizing well enough to complex daily tasks that normally draw on the combination of several types of attention (Sohlberg & Mateer, 2001). More recently, attention training has been approached through the practice of mindfulness and has been shown to improve attention-related behaviours by enhancing several types (focused, sustained, selective, alternating) of attention simultaneously (Jha, Krompinger, & Baime, 2007; Valentine & Sweet, 1999). The benefits of mindfulness

practice on attention have also been confirmed by ADHD interventions that incorporate mindfulness training (Zylowska, 2012; Zylowska et al., 2008). This practice directs attention toward the present moment and requires that the focus of attention be sustained over time on a particular task, such as the breath, while attempting to ignore distractions (Bishop et al. 2004).

However, just like self-regulation, directed attention requires effort and is susceptible to depletion (Kaplan, 1995; Kaplan & Berman, 2010). Stringent cognitive efforts are more likely to deplete directed attention resources than tasks that are simple or automatically performed. Directed attention fatigue (DAF) can result in the inability to fight off distractions, make appropriate plans or decisions, or correctly interpret situations, and also increases impulsivity, restlessness, and irritability (Kaplan & Berman, 2010). These symptoms of DAF reflect the characteristics of ADHD, and for this reason ADHD scales are commonly used to measure attention fatigue (Wells, 2000). However, unlike ADHD, attention fatigue is a temporary condition, and as mentioned earlier, can be improved (Kaplan, 1995; Kaplan & Berman, 2010; Masicampo & Baumeister, 2008).

Kaplan's (1995; 2001) attention restoration theory stipulates that certain types of person-environment interactions and the practice of mindfulness can reverse DAF. It is not surprising then that ADHD research also found that in addition to attention training (Sohlberg & Mateer, 2001), spending time in nature (Kuo & Taylor, 2004), as well as the practice of mindfulness can reduce ADHD-related symptoms (Zylowska, 2012; Zylowska et al., 2008).

To a certain point we are protected from DAF by naturally and regularly occurring attention lapses. But these lapses can also occur due to lack of attention control. Attention recovery is dependent on our metacognitive (thinking about thinking) awareness, allowing for the recognition that our mind has wandered from its original focus. Mind wandering interferes

with the encoding of incoming information and results in inappropriately synthesized understanding (Smallwood et al., 2007), supporting the notion that unattended information is attenuated (Treisman & Riley, 1964). Recognition of attention lapses can be improved with Wells's (2008) metacognitive therapy which promotes the passive observation of mental events (detached-mindfulness). The recognition of attention lapses could also be improved with the regular practice of mindfulness meditation (Flook et al., 2010; Teasdale, 1999).

Accordingly, improving attention control (Mulligan, 1998; Schmidt, 1995), restoring and strengthening cognitive resources (Kaplan, 1995; Kaplan & Berman, 2010), and enhancing the ability to recognize attention lapses (Smallwood et al., 2007) are essential practices for attaining academic success. The practice of mindfulness has been shown to not only improve self-regulation (Kabat-Zinn et al., 1985; Shapiro & Schwartz, 1999, 2000), but also to reduce mind wandering (Flook et al., 2010; Teasdale, 1999), facilitate the recovery of depleted resources (Kaplan, 2001), and increase the capacity of directed attention (Jha et al., 2007; Valentine & Sweet, 1999).

Psychological Distress and Academic Functioning

Psychological distress associated with negative emotions such as stress, anxiety, and depression are known to interfere with academic performance and productivity, and to negatively influence students' decision to complete their education (Andrews & Wilding, 2004; Eisenberg et al., 2009; Kennett & Reed, 2009; Sheilds, 2001; Weinstein & Palmer, 2002). Stress results in poor academic functioning when students are not able to cope with educational stressors (Kennett & Reed, 2009; Sheilds, 2001) such as preparing for multiple examinations (Misra & McKean, 2000). Although students perceive the beginning, middle, and end of a semester as

being equally stressful, stress increasingly interferes with academic functioning as the term progresses (Rafidah et al., 2009).

Stress affects the prefrontal cortex region of the frontal lobe. Even mild stress can negatively affect cognitive abilities such as recall (Cohen & Weinstein, 1981), logical reasoning (MacDonald & Lubuc, 1982), and/or information processing (Rohrmann et al., 1999). Prolonged stress can cause physiological changes in this brain region (Arnsten, 2009) and lead to the deterioration of health behaviours, such as reduced self-care or cessation of exercise routines (Weider et al., 1996), which have been also associated with poor academic functioning (Trockel et al., 2000).

Lazarus (1966) suggested "stress occurs when an individual perceives that the demands of an external situation are beyond his or her perceived ability to cope with them" (p. 9). In other words, the level of stress a student may experience is correlated with their perceived ability to meet the demands of their environment (Staal, 2004). There are individual differences in how a person may become stressed, the magnitude of their physiological and emotional stress responses, and how long it may take them to recover from the stressor. According to Williams et al. (2009), EF processes moderate each of these phases, as self-regulation plays an important role in both protecting and recovering from stress. For example, a student who struggles with time or resource management could experience more stress than peers who have no time-management difficulties and make good use of their resources (Kennett & Reed, 2009). Furthermore, EF plays a role in the appraisal of situations, and as such, influences subjective and physiological reactions to adverse events (Williams et al., 2009). Whereas response flexibility may reduce stress activation the tendency to ruminate can have negative effects on recovery.

Given that directed attention is critical for all cognitive functions, it is not surprising that stress influences cognitive abilities through its effect on attention. According to the *tunnelling hypothesis*, stress can narrow attention from peripheral to centrally important tasks. Depending on perceived threat level, performance circumstances, and task complexity, stress can either enhance (i.e., low arousal, simple task) or impair (i.e., high arousal, complex task) performance (Beilock, Carr, MacMahon, & Starkes, 2002; Staal, 2004). C*apacity-resource theory* proposes that increasing demands deplete attention resources, reducing one's ability to perform all but well-learned and rehearsed tasks (Chajut & Algom, 2003). This suggests that whereas stress orients toward the task at hand and reduces attentional distractions, this process is beneficial insofar as the person perceives the situation as manageable. When this threshold is surpassed, resource depletion occurs—similar to ego-depletion and DAF—and can potentially interfere with further sustained attention, recall functions, judgment, and decision-making (Chajut & Algom, 2003).

Academic functioning is further compromised by generalized and specific (exam) anxiety and depression, and similar to stress, these negative mood states also interfere with students' cognitive functioning, well-being, and exam performance (Andrews & Wilding, 2004; Eisenberg et al., 2009; Weinstein & Palmer, 2002). More specifically, elevated levels of these negative emotions can reduce students' ability to concentrate on academic tasks, increase self-criticism regarding academic achievements (Weinstein & Palmer, 2002), lead to rumination (Papageorgiou & Wells, 2001), and interfere with health behaviors (Weider et al., 1996). Depression and anxiety in students have been also associated with attaining lower grades and increased risk of dropping out (Eisenberg et al., 2009). Furthermore, worries about academic performance, personal relationships, and finances have been shown to increase anxiety and

depression as the term progresses (Andrews & Wilding, 2004; Eisenberg et al., 2009). Although low levels of academic anxiety may improve students' productivity, higher levels of anxiety and depression, especially when they co-occur, have been shown to have a devastating and long-term effect on students' well-being and on their academic functioning (Eisenberg et al., 2009).

Given the prevalence of elevated levels of anxiety, depression and stress among post-secondary students most universities offer health and counselling services as part of their health benefits package. These mental health conditions are generally treated with medication or psychotherapy, such as cognitive behavior therapy (CBT). However, over the last decade mindfulness-based interventions, such as mindfulness-based stress management (MBSR) and mindfulness-based cognitive therapy (MBCT), have emerged as potentially viable interventions for stress, anxiety, and prevention of depression relapse (Baer, 2003; Kabat-Zinn et al., 1985; Teasdale, Segal, & Williams, 1995, Teasdale et al., 2000). Research also indicates that mindfulness practice has a positive effect on students' ability to cope with psychological distress associated with university life (Lynch, Gander, Kohls, Kudielka, & Walach, 2011). This indicates that mindfulness practice—in addition to it's previously mentioned benefits—may also improve students' mental health and provide them with much needed strategies for dealing with psychological distress. Therefore, it appears that mindfulness practice could be a well-rounded solution for facilitating students' academic success.

Mindfulness

Mindfulness can be understood either as a stable personality trait or as a mind state occurring in the moment (Brown & Ryan, 2003). As a trait, mindfulness refers to the inherent state of consciousness. People differ in their average level of awareness—based on intensity and habitual tendencies—that they usually dedicate to any life experience (Brown & Ryan, 2003). A

person's level of mindfulness can be influenced at state levels through the practice of formal and informal mindfulness, which is believed to evoke psychological, physiological, and cognitive changes (Kabat-Zinn, 1990, Segal, Williams, & Teasdale, 2002).

Mindfulness meditation is an ancient Buddhist practice that entails a non-judgmental, moment-to-moment observation of unfolding internal or external events with the aim to sustain present-moment awareness and to cultivate equanimity (i.e., acceptance, non-reactivity, non-attachment). Mindfulness meditation is an awareness practice, where the focus is on noticing mind wandering and anchoring attention on the breath. As such, it is different from other types of meditation practices (e.g., devotional contemplation, transcendental meditation, mantra or focused meditation) that may require concentration—maintaining attention on task through mental effort—on a predetermined object, such as a word or sound. Although, there are many definitions of mindfulness, it is most often defined as "paying attention in a particular way; on purpose, in the present moment, and non-judgmentally" (Kabat-Zinn, 1994, p. 4).

Mindfulness practice can take the form of either a formal sitting meditation or an informal awareness practice, such as paying attention to performing a daily task (Bhikkhu, 2009; Khong, 2009). Kabat-Zinn (1990) developed an 8-week group program called *mindfulness-based stress reduction* (MBSR) that combines both formal and informal meditation practices. Program participants learn to integrate different mindfulness practices into their daily lives to help them experience mindful states without evoking judgment or elaboration. MBSR has been successful in providing physical and psychological benefits in both its full-length (8 weeks; Baer, 2003) and reduced-length formats (e.g., 4 and 6 weeks; Carmody & Baer, 2009; Jain et al., 2007; Klatt, Buckworth, & Malarkey, 2009). However, for benefits to occur participants must attend a minimum of four sessions (Ma & Teasdale, 2004, Teasdale et al., 2000).

The success of MBSR inspired the integration of mindfulness into *cognitive behaviour therapy* (CBT), where treatment focuses on altering a person's relationship with cognitive events rather than challenging the content of thoughts (Segal et al., 2002). *Mindfulness-based cognitive therapy* (MBCT; Segal et al., 2002) has been reported to reduce depression relapse rates by close to 50% in remitted patients who had more than three depressive episodes (Segal et al., 2010; Teasdale et al., 1995; Teasdale et al., 2000) and is now considered a first-line intervention for relapse prevention. The success of mindfulness-based therapies indicates that adding mindfulness-based interventions to retention program curriculums may improve mental health outcomes.

Bishop et al. (2004) operationally defined mindfulness as having two active components: *self-regulation of attention* and *orientation to experience*. Self-regulation of attention requires the development of metacognitive skills, such as maintaining and switching attention and inhibiting elaboration. Orientation to experience entails bringing awareness to the experience at hand, with curiosity, openness, and acceptance. Shapiro, Calson, Astin, and Freedman (2006) suggested *intention* to be a potential third component, because when someone intentionally attends to an event with openness and without judgment, significant shifts in perception can occur. As mentioned previously, the practice of mindfulness aids in the generation of a self-as-context point of view. As such, it also plays an important role in self-reflective or self-observational processes that enhance one's present moment awareness of internal states, thoughts, feelings, physical sensations, and external surroundings (Lau et al., 2006).

Mindfulness and cognition. The effects of meditation on attention-related brain activation and structural changes (e.g., thickening of the prefrontal cortex) are well established through neurophysiological research (Brefczynski-Lewis, Lutz, Schaefer, Levinson, & Davidson, 2007; Lazar et al., 2005; Luders, Toga, Lepore, & Gaser, 2009; Siegel, 2007). For example,

electroencephalography (EEG) studies indicate that mindfulness meditation produces a variety of electrical signals in the form of frequency bands (delta, theta, alpha, and beta) during the activation of the frontal, central, or posterior parts of the brain (Dunn, Hartigan & Mikulas, 1999; Ivanovski & Malhi, 2007). While these activations are experience-dependent, in general they reflect increased cognitive processing and awareness (Ivanovski & Malhi, 2007). Brefczynski-Lewis et al.'s (2007) functional magnetic resonance imaging (fMRI) study demonstrated that established meditators are less affected by distraction and have stronger activation of inhibitory and attentional responses than novice meditators. Furthermore, MRI research has revealed greater activation in brain regions that underlie memory, learning, self-reference, perspective taking, and emotion regulation (Hölzel et al., 2011). In addition to the studies that indicate long-term practice results in greater brain activation and plasticity, Davidson et al's. (2003) research demonstrated significant brain and immune function changes after the 8-week long MBSR in novice meditators. These functional and structural brain changes may explain the long-term benefits of MBSR program on psychological and physiological functions (Davidson et al., 2003), and support the previously mentioned potential benefits of mindfulness on academic functioning.

Research has also indicated the effectiveness of mindfulness-based interventions in attention training (Jha et al., 2007; Valentine & Sweet, 1999), but results are not consistent (Josefsson & Broberg, 2011). The discrepancy in findings is likely due to methodological problems, such as lack of appropriate assessment of attention and small sample size (Ivanovski & Malhi, 2007). However, it could also reflect the earlier mentioned difficulties with assessing global or specific frontal lobe executive and attention functions.

Regardless of inconsistent study findings, mindfulness practice seems to improve information processing (Breslin, Zack, & McMain, 2002; Wells, 2002) and metacognition (Flook

et al., 2010; Teasdale, 1999). By enhancing awareness, mindfulness allows for more flexibility in responding to situations and strengthens the ability to control thoughts. Consequently, the practice of mindfulness may lead to a more complete experience of the present moment and to the formation of more meaningful cognitive connections.

Furthermore, mindfulness has been suggested to regulate achievement-related positive and negative emotions in post-secondary students and is associated with achievement-related self-regulation, such as delaying gratification or seeking help (Howell & Buro, 2010; Shao & Skarlicki, 2009). Research also indicates that mindfulness-based interventions can improve students' EF processes, and students with poor EF processes seem to have the most improvements in executive functioning from the practice of mindfulness (Flook et al., 2010). Mindfulness-based interventions also have well-documented positive influences on psychological and physical well-being (Baer, 2003) and on reducing the symptoms of negative emotions (Baer, 2003; Ivanovski & Malhi, 2007; Kabat-Zinn et al., 1992; Teasdale, 1999, Teasdale et al., 2000). The mood benefits of mindfulness have been also observed in university students (Lynch et al., 2011).

To our knowledge no research has directly assessed whether mindfulness meditation can improve academic functioning in post-secondary students, although, some research has investigated the effect of meditation practice on academic success (Fiebert & Mead, 1981; Hall, 1999; Kember, 1985). Fiebert and Mead (1981) examined the benefits of a short awareness meditation practice prior to class and study periods on examination results. They found that students who practiced meditation performed better on examination without increasing study time. They hypothesized that improvements were due to students' enhanced ability to pay attention. Hall's (1999) research investigated the benefits of 10 minutes of meditation before and

after study periods for one semester. At the end of the semester students who received the meditation intervention achieved significantly higher grades than those in the control condition. Kember (1985) found similar results following the practice of transcendental meditation. Finally, trait mindfulness in female post-secondary students has been found to predict better academic performance (Shao & Skarlicki, 2009).

The benefits of mindfulness meditation on academic performance have been investigated in adolescent students (M = 16.61 age) who had learning disabilities. Beauchemin, Hutchins, and Patterson (2006) found that following a 5-week mindfulness-based intervention, students' academic anxiety decreased and their social and academic performance improved. These researchers suggested that reduction in cognitive disturbances decreased students' anxiety and self-focus which in turn, improved their social and academic functioning. In addition, the practice of mindfulness has been found to improve concentration (Bostanov, Philipp, Kotchoubey, & Hautzinger, 2012) and working memory under stressful situation through the regulation of emotions, both of which play essential roles in successful learning (Jha, Stanley, Kiyonaga, Wong & Gelfand, 2010). The benefits of mindfulness practice on academic functioning can also be inferred from the behavioural and cognitive improvements seen in people with ADHD following mindfulness-based interventions (Zylowska, 2012; Zylowska et al., 2008).

Mindfulness practice benefits are believed to be due to its effect on self-regulation, directed attention, self-observation and reflection, and negative emotions (Baer, 2003; Beauchemin, Hutchins, & Patterson, 2006; Bishop et al., 2004; Breslin et al., 2002; Flook et al., 2010; Hall, 1999; Fiebert & Mead, 1981; Kember, 1985; Lau et al., 2006; Jha et al., 2010). Because mindfulness-based programs are typically delivered in a group format, they can be easily integrated into retention programs without requiring other curriculum adjustments.

Accordingly, it is plausible that a mindfulness-based program administered as part of a retention program can lead to improved retention outcomes. Additionally, the program could be also offered to student who are not on academic warning, but who are interested in preventing academic failure or improving their grades.

However, mindfulness research has been challenged with high attrition rates (30 to 40%; Baer, 2003; Crane & Williams, 2010) and systematic homework compliance is rarely reported with research results, limiting conclusion that can be drawn about the relationship between mindfulness practice and program outcomes (Baer, 2003; Vettese, Toneatto, Stea, Nguyen, & Wang, 2009). Attrition and homework compliance may be particularly problematic in post-secondary populations. Students have limited time for extracurricular activities and attending 8 weekly 2.5-hour sessions and engaging in 45 minutes of daily formal meditation practice may not be feasible. Although two previous studies reported a 23-33% attrition rate with university students (Jai et al., 2007; Lynch et al., 2011), anecdotal evidence from the field indicates problems with students' program compliance (M. London, personal communication, March 28, 2012; M. Murdock, personal communication, September 6, 2012; M. Reck, personal communication, March 25, 2012).

To decrease the chance of attrition and increase homework completion experts from the University of Vermont recommended shortening program and session length and reducing home-practice requirements (M. London, personal communication, March 28, 2012; M. Reck, personal communication, March 25, 2012). Since mindfulness-based interventions have been successful even in reduced lengths (Carmody & Baer, 2009; Jain et al., 2007; Klatt et al., 2009), it is possible that a shorter program and reduced amount of home practice might be more feasible and successful with student populations.

Mindfulness for academic success (MAS) program. The MAS program is a 6-week adapted mindfulness-based intervention that incorporates elements from both MBSR and MBCT. It was put together for the purpose of this research and has been modified to focus on academic life and to improve students' compliance with the program requirements. This mindfulness-based program aims to help post-secondary students regulate their emotions and behaviours, pay better attention to academic tasks, recover faster from attention lapses, improve their information processing, and reduce their general and academic related psychological distress.

The MAS program is different in two ways from the MBSR and MBCT programs. Most importantly, MAS makes use of academic life examples to explain mindfulness concepts, such as automatic thinking, staying present, event interpretation, generating alternative explanations, and dealing with barriers. For example, students have the opportunity to investigate how different interpretations of an event, such as receiving a poor grade, may leave them with more or less power to improve future outcomes. The number and duration of sessions and homework requirements have also been modified to enhance compliance with the program. The MAS program includes six weekly sessions of 1.5-hours each. Homework has been reduced to approximately 20 minutes of formal and informal practice per day. The primary homework task is the 3-minute-breathing-space and students are asked to make use of this practice three times per day before any academic activity (class, homework, and exam). This mini-meditation practice is intended to bring brief periods of formal meditation into daily academic life. The MAS program outline is described in Appendix C.

Summary

Research indicates that high post-secondary dropout rate is associated with poor academic functioning, which is attributed in part, to deficiencies in EF processes and insufficient

coping strategies. While retention programs have been successful in retaining on average 30% of participants by teaching them specific EF driven academic skills, we know that the effectiveness of these programs is variable (from d = -0.16 to 0.56 effect size) and in need of improvement (Thompson, 2010).

As shown in Figure 1 targeting the main function of EF (self-regulation) and its governing factor (directed attention), in addition to improving students' ability to recognize mind wandering and facilitating the recovery and increased capacity of their attention and cognitive resources (ego-depletion and directed attention fatigue), could lead to improvements in their academic functioning. Although each of these components could be addressed individually, the MAS program provides a unified approach to improving the cognitive, psychological, and physiological processes required for academic success. Additionally, the MAS program was modified to address anticipated problems with attrition and homework compliance. Finally, because the MAS program is a group intervention it can be implemented either on its own as a preventative measure to reduce the risk of potential academic failure, or combined with already existing retention programs to improve these outcomes.

Figure 1. Association Between Academic Functioning and Executive Functioning, Directed Attention, Psychological Distress, and the Regular Practice of Mindfulness

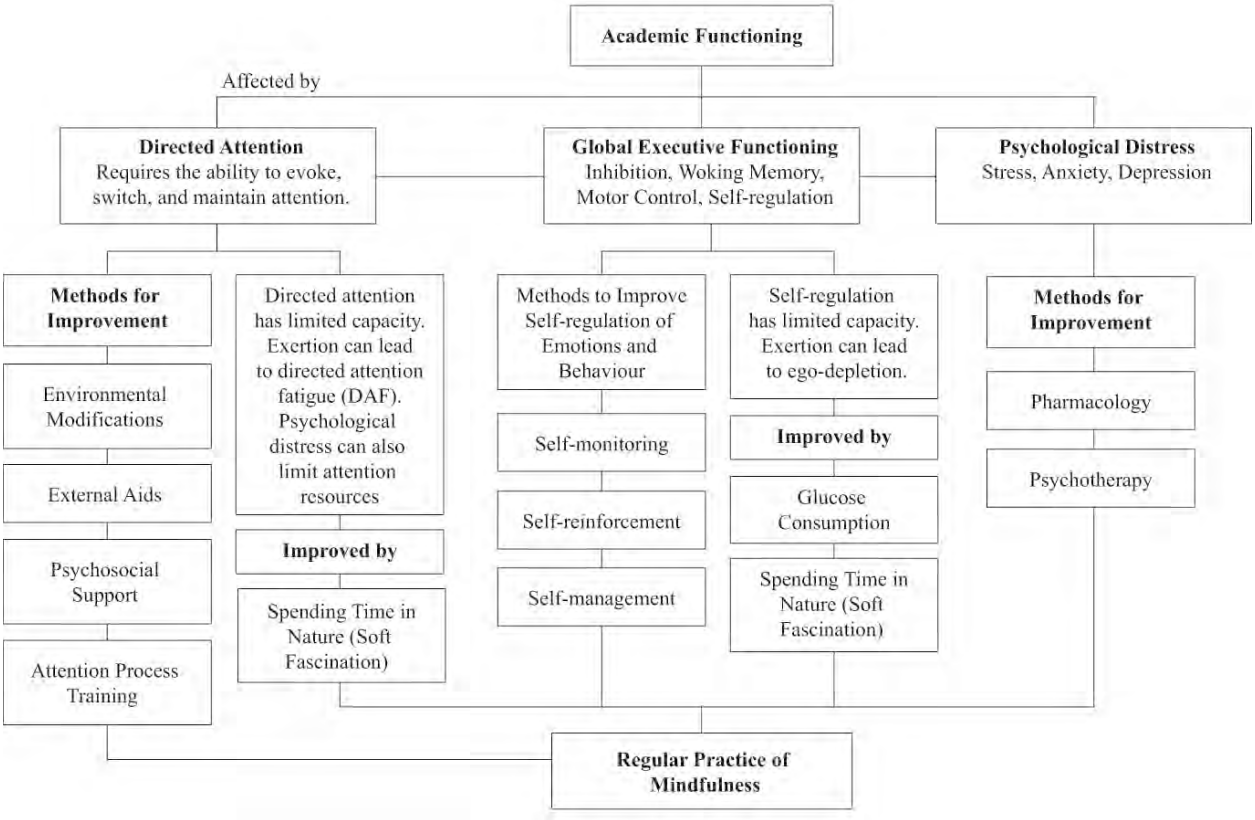


Figure 1. Flow chart depicts the connections between academic functioning and directed attention, global executive functioning, psychological distress, and the regular practice of mindfulness. The figure also illustrates methods for improving directed attention, global executive functioning, psychological distress, and indicates potential threats to these capacities and how depleted resources could be improved. The practice of mindfulness is highlighted to demonstrate that it may offer a unified approach to improve academic functioning.

Current Study

Pilot studies are recommended when the feasibility of a new intervention has not been established or an existing program is being used with a new population. Feasibility studies are also used to assess ease of recruitment, acceptability of an intervention, study compliance, and variance and effect size estimates of an intervention (Arain, Campbell, Cooper, & Lancaster, 2010; Thabane et al., 2010). The primary focus of such studies is to establish the feasibility of the intervention, post-secondary students, the primary purpose of this research was to establish the feasibility of delivering the MAS program to students who were experiencing difficulties with their academic functioning. The secondary aim of this pilot study was to establish the preliminary efficacy of the MAS program in improving academic functioning. Specifically, the study evaluated whether the MAS program increased EF and the ability to pay attention, reduced mind wandering, symptoms of ADHD, and psychological distress, and improved academic functioning related factors. Feasibility was assessed through recruitment, retention, and compliance with between-session homework. The study was hypothesized to be feasible if:

- We were able to recruit the number of participants required for this study, and if we were able to randomize 70% of eligible individuals who were assessed for the study;
- 70% of participants completed at least four MAS program sessions;
- 70% of all between-session homework was completed

Preliminary efficacy was established if relative to the waitlist (WL) control condition, the MAS program:

- Improved EF;
- Reduced attention deficit related symptoms;
- Improved attention by enhancing the ability to recognize mind wandering;

- Reduced psychological distress; and
- Improved academic functioning.

Method

Participants

The Research Ethics Board of the University of Ottawa and Carleton University approved the study. Forty-two post-secondary students (female = 29, male = 13) between the ages of 17 and 42 (M = 25.10, SD = 6.07) were recruited from Carleton University. The study utilized the following recruitment strategies: 1) Learning support, disability, and health services were visited by the researcher and recruitment posters were placed in the waiting room of these service providers. All three support services invited the researcher to deliver a short presentation of the MAS program to staff. Learning support and disability services placed a recruitment advertisement on their website. An e-mail was sent to each service provider in hope they would advise eligible students about the program; 2) Each university department was also visited by the researcher and administrators were asked to place recruitment posters on the department's advertising boards. Each department's academic advisor was contacted via e-mail to inform them about the MAS program and to ask them to recommend the program to eligible students; 3) Posters were regularly placed in university approved areas and included tear-down sign-up links to www.thepresentmoment.ca/MAS.

Students were eligible to participate in the study if they 1) had completed their first semester; 2) had a C+ or below overall average (undergraduate students) or experienced difficulty meeting degree requirements (graduate students) and were also interested in improving their grades and reducing their stress; 3) were willing to make a commitment to attend all six sessions; and 4) were willing to complete 25 minutes of daily meditation practice at home. Students were excluded if they: 1) were diagnosed with major depression in the last six months; 2) were currently experiencing symptoms of a diagnosed mental health illness—bipolar disorder,

PTSD, or psychosis; 3) had a lifetime history of schizophrenia; 4) were suffering from significant alcohol (drinking excessively 4 times or more per week) or drug abuse (Dobkin, Irving, & Amar, 2011) as reported on the Demographic Information Questionnaire (DIQ); 5) and were practicing any form of meditation 5 or more times a week.

Procedure

Students signed up for the MAS program at www.thepresentmoment.ca/MAS. After agreeing to the terms of the study, they were prompted to create an account using their name, school's name, average GPA, phone number, and email address (see Appendix F for the registration information). Undergraduate students who had higher than C+ GPA or had not completed a semester and had no GPA to report were prevented from registering into the MAS program research study. Only graduate students who were experiencing academic difficulties with completing their thesis were eligible to register. Once the student signed up, they were asked to complete the DIQ and the Depression Anxiety Stress Scale (DASS). The registration process generated an internal 4-digit code for each student and this number, rather than their name was associated with all subsequent information. The researcher was automatically notified by e-mail of the new registration and signed into the password-protected database to retrieve registration information. Students were notified by email that they were eligible to attend the baseline-assessment and were asked to contact the researcher to set up an appointment (see Appendix H for letters to participants).

The study was conducted at the Paul Menton Center at Carleton University. After the researcher explained the study and procedures, the student was asked to sign the *Informed Consent Form* (see Appendix A) and complete the baseline questionnaire package which contained the adult ADHD self-report scale (ASRS), Learning and Study Strategies Inventory

(LASSI), and BDEFS-LF. This was followed by verbal instructions on how to complete the Mind Wandering Task (MWT). After finishing this task, participants completed the Toronto Mindfulness Scale (TMS) based on the experience they had during the MWT.

Following completion of baseline measures participants were randomized to either the MAS program or the WL control condition. Allocations were generated using blocks of 4 to prevent selection bias and to maintain close balance of the numbers of participants in each treatment group at any time during the trial. The block sequences were: 1) MAS, WL, MAS, WL; 2) WL, MAS, WL, MAS; 3) MAS, MAS, WL, WL; 4) WL, WL, MAS, MAS; 5) MAS, WL, WL, MAS; 6) WL, MAS, MAS, WL. The researcher randomly selected each block and students were assigned according to the block's condition sequence. Five of the six blocks were used twice in the study. The randomization process created two equal-sized conditions (n = 20). Two MAS programs ran simultaneously on the same day at different times (9:00 am and 4:00 pm) at Carleton University. WL participants were offered the MAS program after the 6-week delay. One participant from the MAS program condition joined the workshop held for WL participants.

The 6-week MAS program (see Appendix C for program outline) taught a variety of formal (sitting or walking meditation, body scan) and informal (mindful eating, mindful daily task performance) mindfulness practices. As establishing a daily meditation practice is an integral component of mindfulness training, students were asked to complete homework between each class six days per week and log it on the website (see Appendix G for homework record logs). Each week the students were asked to practice 3 times per day the 3-minute breathing space (3MBS). In addition, during Week 1 they were asked to practice mindfulness while engaged in one daily task, and to eat one meal mindfully during the week. Week 2 incorporated a

10-minute daily body scan and students were asked to make note of one positive event that occurred each day. In Week 3, the 15-minute mindfulness of the breath was practiced daily and participants made note of one negative event that occurred each day. At Week 4, participants began to practice the 15-minute seated meditation every day and continued with this practice in Week 5, in addition to incorporating the 3-minute coping breathing space once a day. The weekly 1.5-hour classes consisted of guided meditation exercises followed by group discussion, homework check-ins, and didactic components. Sessions were audio recorded to ensure fidelity to the program. An independent assessor randomly reviewed the recordings.

At the beginning of the first MAS session participants received a binder containing the program information and instructions on how to log their homework on the website. Students were reminded daily by the researcher through e-mail to complete their homework (see Appendix H for letters to participants). Participants were required to log in daily to the website to gain access to the weeks' pre-recorded guided meditation and to record the frequency of their home practice. Participants were also given the opportunity to comment on their mindfulness experiences in writing. These daily practices were discussed during the homework check in phase of the session.

A week after completing the last MAS program session participants returned to the Paul Menton Center to complete the post-study questionnaire package (DASS, ASRS, LASSI, BDEFS-LF) and repeat the MWT followed by the TMS and the Extracurricular Activity Checklist (EAC) scales. WL participants returned at the same time to complete their post-study assessments, but did not participate in any intervention during the wait period.

Participants were not compensated for their participation in the study. However, to encourage homework compliance (at least 70%), program attendance (at least 5 sessions) and

completion of post-study assessments, three cash prizes of $50 were raffled at the end of the study. Although no participant complied with all three requirements, the names of all students who returned for the post-study assessment were entered in the draw. After completion of the last post-study assessment, three names were pulled randomly from the box and the winners were contacted through e-mail (see Appendix H for letters to participants). Students had 14 days to make arrangements for retrieving their prize. In accordance with Canadian law, they had to correctly answer the following skill testing question: 15 + 35 = ? prior to receiving their cash prize.

Mindfulness instructor. The principal investigator who completed both the basic (2011) and advanced (2012) teacher training certification for the MBCT program conducted the MAS workshop. She had facilitated four MBCT programs prior to this research study and taught yoga and meditation for over 10 years. She is also a seasoned meditator with more than 15 years' experience.

Measures

Participant information. The *Demographic Information Questionnaire* DIQ (see Appendix B) was developed for this study to collect information about the participants' age, gender, university status, mental health diagnosis, previous meditation experience, and to assess their program commitment level. This scale was completed online at the time of sign up into the study (www.thepresentmoment.ca/DIQ).

Manipulation check. The 13-item *Toronto Mindfulness Scale* (TMS; Lau et al., 2006; see Appendix B) assessed students' state mindfulness, that is, their ability to evoke and retain attention in a given moment. Mindful states allow for the observation of thoughts and feelings evoked by an experience, while withholding further elaboration or judgment. The TMS is

comprised of two subscales; where one scale indicates participants' level of curiosity in the moment (6-item), and the other reports on their level of decentering (7-item). Curiosity reflects the desire to know more about what is happening in the present moment, whereas decentering can be understood as awareness of one's experience with some distance and disidentification (Teasdale et al., 2002). A Likert scale ranging from 1 (*Not at all*) to 5 (*Very much*) allowed participants to rate themselves on statements such as "I was curious about my reactions to things" (curiosity) and "I experienced myself as separate from my changing thoughts and feelings" (decentering). TMS scores were totalled to establish participants' level of mindfulness, where higher scores indicated a better ability to evoke and retain attention in a given moment.

The internal consistency of TMS is reported to be good for both the curiosity ($\alpha = .93$) and the decentering ($\alpha = .91$) subscale. In the current study the internal consistency of the pre-study TMS was good for the decentering subscale ($\alpha = .83$) but unacceptable for the curiosity subscale ($\alpha = .48$) level. Participants were asked to complete this scale based on their experience during the mind wandering task. This scale was administered pre- and post-study.

Executive functioning. The 89-item *Barkley Deficit in Executive Functioning Scale-Long Form* (BDEFS-LF self-report; Barkley, 2011; see Appendix A) assessed students' global and specific EF. The scale evaluates five domains of EF deficits: *self-management to time* indicates the ability to manage time*; self-organization/problem solving* represents the ability to overcome obstacles of goal attainment*; self-restraint (inhibition)* reflects the capacity to which a person can restrain his/her self from inappropriate cognitive, behavioral, verbal, or emotional reactions*; self-motivation to goal attainment* reveals personal aptitudes to persevere in face of difficulties*;* and *self-regulation of emotions* reflects the ability to regulate strong positive or negative emotions. In addition, the BDEFS provides information about EF related ADHD

symptoms and highlights specific areas of EF deficits. A Likert scale ranging from 1 (*Never or rarely*) to 4 (*Very often*) allowed participants to rate themselves on statements such as "Poor sense of time" and "Late for work or scheduled appointments." BDEFS-LF is known to have excellent (α = .92) internal consistency, whereas subscales range between good (ADHD-EF index, α = .84) and excellent (self-organization/problem solving, α = .96) levels.

In this study the BDEFS-LF's internal consistency at pre-study assessment was also excellent (α = .92), with subscales ranging from acceptable (ADHD-EF index α = .72,) to excellent (self-restraint, α = .92) levels. The BDEFS-LF total score provided the students' EF index, where higher scores are suggestive of more EF difficulties. Individual scores of three and four indicate specific areas of EF deficits at severe levels. In addition, scores were summed for each of the domains to identify problem areas and also included a count for ADHD symptoms. Raw scale scores are interpreted based on where they fall in the percentile range identified by the BDEFS. Scores above the 93th percentile indicate the threshold for EF deficits is in the clinically symptomatic range while scores below the 93th percentile indicate less severe to normalized global and specific EFs. This test was administered as both pre- and post-study.

Attention deficit disorder. The 18-item Adult ADHD Self-Report Scale (ASRS) symptom checklist was developed by the World Health Organization (WHO; Kessler et al., 2005) and is considered to accurately identify individuals with ADHD. Items on this scale correspond to the 18 DSM-IV-TR symptoms of ADHD. The scale inquires about the frequency of symptoms as they occurred over the past six months. A Likert scale ranging from 1 (*Never*) to 5 (*Very often*) allowed participants to respond to questions such as "How often are you distracted by activity or noise around you?" This questionnaire is divided into two parts. Part A (6 items) represents diagnostic symptoms with ADHD where four or more scores in the 3 to 5 ranges

indicate symptoms highly consistent with ADHD. Part B (12-items) provides additional cues and can serve as further probes into ADHD symptoms. Scores are summed in Part B, and higher scores indicate more difficulties with ADHD-related symptoms. Although ASRS does not make use of a total score, for the purpose of secondary correlational analyses, a composite ASRS score was calculated by summing the total of individual items for the purposes of this study. Furthermore, all ASRS items are considered for internal consistency. The ASRS has an acceptable ($\alpha = .72$) level internal consistency, which was maintained ($\alpha = .75$) at pre-study assessment in this study. This test was administered as both pre- and post-study.

Mind wandering. Lapses in attention were assessed with the *Mind Wandering Task* (MWT; see Appendix B for text). The task was adapted for this study from Smallwood, McSpadden, and Schooler, (2008). In the original 50-minute task participants read an abbreviated version (5000 words) of *The Red-Headed League by Conan-Doyle*, (2001) on a computer monitor. The following inference critical time-caught-probe: "Just prior to being asked, was your attention on- or off-task?" appeared on the screen between every 100 to 230 words at random, prompting participants to report on the focus of their attention. They were asked to press the letter T (tuning out) if they knew they were off task prior to the probe, the letter Z (zoning out) if they were surprised at the time of the probe that their mind wandered away from the story, or the letter O if they were on task. After the reading task participants were presented with 23 questions about the novella to measure their story comprehension.

Due to time and resource constraints and because mind wandering was not the primary outcome of interest the MWT task was modified in the current study. Participants listened to an audio-recorded 10-minute segment of *The History of Love* by Nicole Krauss (2006) pre- (p. 3-6) and post-study assessment (p. 19-22; see Appendix D). An individual who was not involved in

the study conducted the pre- and post-study assessment audio recordings. The frequency of mind wandering was tested through the inference critical time-caught-probe test method. At seven different points students were prompted by the sound of a bell on the audio recording to self-report on the MWT questionnaire (see Appendix C) whether their mind was wandering at the time or not by placing a Y (yes) in the appropriate column. Participants received 1 point if they were "focused on the story" and 2 points if they were "thinking about other things". The sum of scores determined the mind-wandering index, where higher scores indicated more lapses in attention. Given the nature of this scale internal consistency could not be calculated. The MWT2 pre- or post-study assessment questionnaire (see Appendix C) was administered immediately after the listening task and measured how well participants paid attention to the story. Seven character-related questions, such as "What type of glasses did Bruno wear?" corresponded to information that occurred in the story at the time of the probes. Correct answers received 1 point and missing or incorrect information was assigned 2 points. Scores were summed to determine the attention index, where higher scores indicated poorer attention. This task was administered as both pre- and post-study.

Psychological distress. Participants' level of depression, anxiety, and stress was measured with the DASS (Lovibond & Lovibond, 1995; see Appendix B). This self-report inventory measures 42 negative emotional symptoms such as "I felt downhearted and blue" and "I felt that I had nothing to look forward to." Participants reported the frequency and severity of each symptom as it occurred over the past week on a Likert scale ranging from 0 (*Did not apply to me at all*) to 3 (*Applied to me very much or most of the time*). Summing the scores of each subscale (14 items) provided an index of participants' level of depression, anxiety, and stress, with higher scores on each subscale indicating more psychological distress. The internal

consistency of the DASS ranges from good (anxiety, α = .84) to excellent (depression α = .91; stress α = .94). In the current study the scale also had good (anxiety α = .87; stress α = .86) to excellent (depression, α = .90) internal consistency at pre-study assessment. This scale was administered at the time of sign-up and at post-study.

Academic functioning. Academic functioning deficits and progress were assessed with the 80-item *The Learning and Study Strategies Inventory* (LASSI; Weinstein et al., 1987; see Appendix A). The LASSI measured students' attitudes, behaviours, and thought processes related to study strategies and learning. The scale provides information about ten specific aspects of academic functioning: *Anxiety*, as it relates to tension and concerns about doing academic tasks; *Attitude* toward schoolwork and general motivation to succeed in school; *Concentration*, the ability to maintain and direct attention to school related activities; *Information processing*, the ability to elaborate, organize, understand, and recall academic information; *Motivation* to perform the specific tasks connected to the attainment of school related goals; *Self-testing*, the ability to understand the importance of reviewing information and testing oneself to attain and monitor knowledge; *Study aids,* the ability to make and use study aids that support learning and retention; *Selecting main idea*, the ability to identify the important information to be studied' *Test strategies,* the ability to prepare and use test-taking strategies; and *Time management,* the ability to make and use of schedules. Although LASSI does not make use of a total score, for the purpose of secondary correlational analyses, a composite LASSI score was calculated by summing the total of individual items.

Students were asked to indicate with the use of a Likert scale ranging from 1 (*Not at all like me*) to 5 (*Very much like me*) how much each statement describes them. Each subscale scores are summed together to determine level of functioning. Subscale scores below 50 indicate

the *need* for improvement to avoid academic problems, scores between 50 to 75 suggest *consideration* for improvement, while scores above 75 denote that the student is performing the task in a manner where no further changes is required for academic success. The subscales' internal reliability is reported to range from poor (α = .68, study aids) to good (α = .85, time management) levels. In this study the LASSI's subscale internal consistency at pre-study assessment was as follows: good for selecting main idea (α = .89), concentration (α = .87), anxiety (α = .84) and self-testing (α = .81), acceptable for information processing (α = .79); motivation (α = .78), test strategies (α = .77), time management (α = .74), and study aids (α = .70); and poor for attitude (α = .69). This scale was administered as both pre- and post-study.

Extracurricular activities. The *Extracurricular Activity Checklist* (EAC; see Appendix B) was developed for this experiment to identify if participants randomized to either condition engaged in activities that might affect outcome. The activities included: meditation, yoga, exercise, tutoring, study groups, requesting regular help from a professor or teaching assistant (TA), seeking counselling, or engaging in any other type of stress reduction program or activity. This scale was a part of the post-study assessment.

Statistical Methods

Data was analyzed by SPSS version 21. Data analyses were performed on the intent-to-treat (ITT) and completer samples. The intent-to-treat sample included all randomized participants. The completer sample included participants who attended a minimum of 4 (66%) MAS sessions or completed the 6-week wait period. The definition of MAS completers is in line with established minimum adequate dose for mindfulness-based interventions required for benefits (Ma & Teasdale, 2004, Teasdale et al., 2000). The last observation carried forward method was used to impute missing data. However, no observation was available for one

participant who failed to complete the BDEFS-LF self-organization and self-regulation subscale and for another who did not complete the MWT task.

Analysis of variance (ANOVA) and chi-square were used to compare groups on demographic and academic variables (age, gender and academic status) and baseline outcome measures (DASS, TMS, ASRS, BDEFS-LF, LASSI, MWT and MWT2). Feasibility was established using chi-square, ANOVA and Pearson's correlations. Pearson's correlations were performed to establish potential relationships between outcome measures, age, session attendance, and homework compliance. Preliminary efficacy was determined by evaluating group differences at post-study. As recommended by Vickers (2005) and Vickers and Altman (2001), analysis of covariance (ANCOVA) was used to compare groups on post-study outcomes, with baseline scores of each measure was used as the covariate. Pearson's correlations were also performed to establish potential relationships between outcome variables. Dependent measures included level of mindfulness (TMS), executive functioning (BDERS-LF), ADHD (ASRS), attention (MWT), psychological distress (DASS), and academic functioning (LASSI). In addition to the ANCOVA, within and between-group effect sizes (i.e. Cohen's *d*) and the 95% CI around the between-group effect size were calculated with the use of ClinTools Software (Devilly, 2005). According to convention, an effect size is considered to be small between 0.2 to .05, medium between 0.5 to 0.8, and large over 0.8. Given this was a feasibility study with a limited number of participants we did not use the Bonferroni correction for multiple testing. Significance was established at $p < .05$ for all analyses.

Results

Participant Flow

Recruitment took place from September to October 2012 and baseline measures were collected at the same time. Post-study assessment took place during the fall final examination period, in December 2012. Figure 1 displays the flow of participants during the study. Forty-two participants registered to participate in the study. Because the website was set up to only allow registration from students who had C+ or below overall average (undergraduate students) or experienced difficulty meeting degree requirements (graduate students), they all met the first and second eligibility requirements. All participants indicated on the DIQ that they were willing to commit to attend all six sessions and to complete homework requirements. No student was excluded from the study based on the exclusion criteria.

One participant was not accepted into the study due to lack of English proficiency and another student dropped out prior to baseline-assessment due to illness. Forty students, reflecting 95% of all screened participants, were randomized to either the MAS program (n = 20) or WL (n = 20) condition. No student refused to participate after treatment allocation. Sixty-two percent of participants (n = 25) completed this research study. Among participants assigned to the MAS program, 45% (n = 9) were treatment completers (i.e., attended 4 or more MAS sessions) and 55% (n = 11) returned for post-study assessment. Eighty percent of the WL participants (n = 16) completed post-study assessments. Reasons for early termination appear in Figure 2.

Baseline Characteristics

Several outliers were discovered in the dataset, but none were three standard deviations above the mean for any of the dependent variable. Therefore, no adjustment was made. The data was significantly skewed for the baseline depression subscale scores of the MAS program

condition (greater than $Z = 2.58$). As recommended by Tabachnick and Fidell (1983) a logarithmic transformation was performed to improve the normality of the distribution of this subscale.

Table 1 describes the demographic and academic characteristics of the sample. The mean age of participants in the MAS program ($M = 25.70$, $SD = 6.37$) and the WL ($M = 24.50$, $SD = 5.84$) condition was not significantly different $F(1, 38) = 0.38$, $p = .54$. Furthermore, there was no statistical difference in participants' age, between completers (26.04 ± 6.18) and dropouts (23.53 ± 5.73), $F(1, 38) = 1.63$, $p = .21$. Gender distribution was similar across conditions (Male = 30%, Female = 70%), $\chi^2 (1) = .00$, $p = 1.00$. There was also no statistical difference in participants' gender between completers (Male = 20%, Female = 42%) and dropouts (Male = 10%, Female = 28%), $\chi^2 (1) = .127$, $p = .72$. The academic status of participants in the MAS (Undergraduate = 65%, Graduate = 35%) and WL (Undergraduate = 85%, Graduate = 15%) conditions was not different, WL $\chi^2 (1) = 2.13$, $p = .14$. There was also no statistical difference in participants' academic status between completers (Undergraduate = 42%, Graduate = 20%), and dropouts (Undergraduate = 33%, Graduate = 5%), $\chi^2 (1) = 1.74$, $p = .19$.

Table 2 provides data on participants' familiarity with mindfulness and level of commitment to complete the program. Familiarity with mindfulness in the MAS program (Read about it = 5%, Heard about it = 40%, Not familiar = 55%) and WL (Read about it = 5%, Heard about it = 45%, Not familiar = 50%) conditions was not different, $\chi^2 (2) = .11$, $p = .95$. There was also no statistical difference in participants' familiarity between completers (Read about it = 5%, Heard about it = 30%, Not familiar = 28%) and dropouts (Read about it = 0%, Hear about it = 12%, Not familiar = 25%), $\chi^2 (2) = 2.59$, $p = .27$.

Participants' level of commitment to complete the MAS program (Extremely = 90%, Moderately = 10%, Somewhat = 0%, Not at all = 0%) or WL (Extremely = 75%, Moderately =

25%, Somewhat = 0%, Not at all = 0%) conditions was not different, χ^2 (3) = 1.56, p = .21. There was also no statistical difference in participants' commitment between completers (Extremely = 50%, Moderately = 13%, Somewhat = 0%, Not at all = 0%) and dropouts (Extremely = 32%, Moderately = 5%, Somewhat = 0%, Not at all = 0%), χ^2 (3) = .29, p = .59.

Table 1

Summary of Participant's Age, Gender, and Academic Status

Demographics	MAS program (n = 20)	WL (n = 20)	Total sample
Mean age (year)	25.70 ± 6.37	24.50 ± 5.84	25.10 ± 6.07
Completers	27.67 ± 6.04	25.13 ± 6.26	26.04 ± 6.18
Dropouts	24.09 ± 6.46	22.00 ± 3.16	23.53 ± 5.73
Gender (%)			
Male	30%	30%	30%
Completers	15%	25%	20%
Dropouts	15%	5%	10%
Female	70%	70%	70%
Completers	30%	55%	42%
Dropouts	40%	15%	28%
Academic status (%)			
Undergraduate	65%	85%	75%
Completers	20%	65%	42%
Dropouts	45%	20%	33%
Graduate	35%	15%	25%
Completers	25%	15%	20%
Dropouts	10%	0%	5%

Note. Values are the mean ± standard deviation unless otherwise specified

Table 2

Summary of Participant's Familiarity with Mindfulness, and Level of Commitment to Complete the MAS Program

	MAS program (*n* = 20)	WL (*n* = 20)	Total sample (*n* = 40)
Mindfulness (%)			
Read about it	5 %	5 %	5 %
Completers	5 %	5 %	5 %
Dropouts	0 %	0 %	0 %
Heard about it	40 %	45 %	42 %
Completers	25 %	35 %	30 %
Dropouts	15 %	10 %	12 %
Not Familiar	55 %	50 %	53 %
Completers	15 %	40 %	28 %
Dropouts	40 %	10 %	25 %
Commitment level (%)			
Extremely	90 %	75 %	82 %
Completers	40 %	60 %	50 %
Dropouts	50%	15 %	32 %
Moderately	10 %	25 %	18 %
Completers	5 %	20 %	13 %
Dropouts	5 %	5 %	5 %
Somewhat	0 %	0 %	0 %
Completers	0 %	0 %	0 %
Dropouts	0 %	0 %	0 %
Not at all	0 %	0 %	0 %
Completers	0 %	0 %	0 %
Dropouts	0 %	0 %	0 %

Figure 1. Flow of Participants During the Study

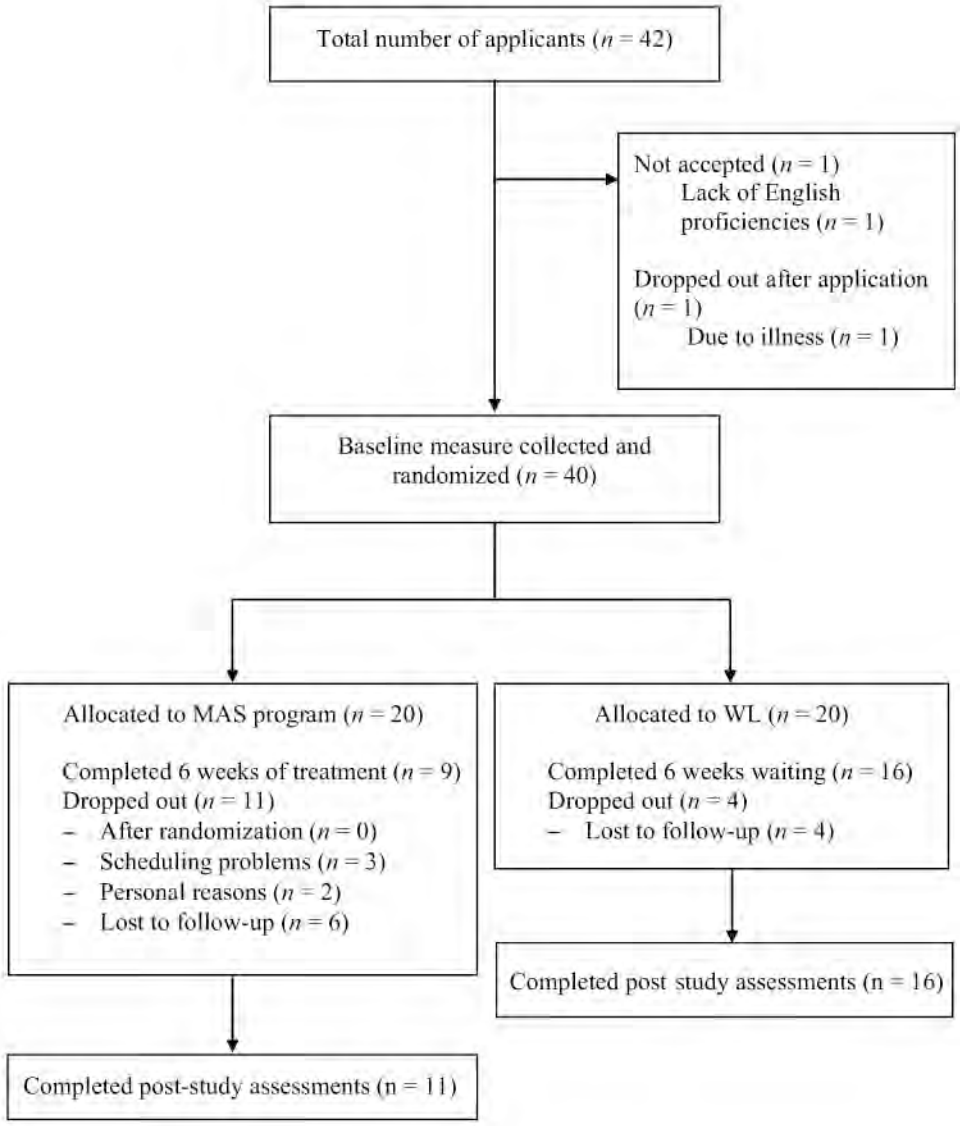


Figure 1. Flow chart follows recruited participants' randomization, condition allocation, program completion and reason for attrition.

Feasibility

Recruitment and Randomization. The trial was considered feasible if we were successful in randomizing 70% of screened individuals, if at least 70% of students completed four or more sessions of the MAS program, and if compliance with between-session homework reached 70%. Forty-two students signed up for the study via the Internet and we were able to randomize 95% of applicants (n = 40) into the two conditions. This indicates that we randomized 25% more participants than the minimum (65%) feasibility requirement established for this study.

Attrition. Based on our feasibility requirements, the overall dropout rate was 38%. Attrition in the MAS program was 55%, and in the WL condition it was 20%, making the differential attrition rate statistically significant, χ^2 (1) = 5.23, p = .02 Accordingly, attrition was considerably greater than the 30% rate established for this trial and significantly higher in the MAS program than in the WL condition. Table 3 describes attendance in the MAS program condition.

In the MAS completer sample (n = 9), participants attended 87% of sessions, with a mean of 5.22 (SD = 0.83) sessions. Among these participants, four (20%) attended all six sessions, three (15%) attended five sessions, and two (10%) attended four sessions. Participants who attended two or less sessions were considered to be dropouts. These participants attended on average 18% (M = 1.09, SD = 0.70) of sessions. Three (15%) participants attended two sessions, six (30%) came only to the first session, and two (10%) participants did not show up to any sessions.

Table 3

Session Attendance for Participants' in the MAS Program Condition

Number of Sessions	Number of Participants (*n* = 20)	
	Dropout	Completer
0 session	2 (10%)	—
1 session	6 (30%)	—
2 sessions	3 (15%)	—
3 sessions	—	0
4 sessions	—	2 (10%)
5 sessions	—	3 (15%)
6 sessions	—	4 (20%)
Average Session Attendance[a]	18% (1.09 ± 0.70)	87% (5.22 ± 0.83)

Note. [a]Values in parentheses are the mean ± standard deviation

Homework compliance. Homework compliance—including the type and frequency of homework—was intended to be measured by the online homework log system. However, during Session 2 homework check-in participants began to complain about the inconvenience of having to log into the website to record their homework and they requested that a paper log option be made available. Accordingly, paper logs were distributed after Session two. Table 4 provides information about the method of homework submission (i.e. online log versus paper log) during the MAS program. After Session 3 only one participant used the online log system. In total 53% of all submitted homework was provided on the online homework log system and 47% was reported on paper logs.

Table 4

Homework Reporting Method (Online Log, Paper Log or No Submission) in the MAS Program

Week	Homework report of MAS program completer participants (*n* = 9)		
	Online log	Paper log	Total submission
Week 1	7	0	7
Week 2	5	4	9
Week 3	3	4	7
Week 4	1	4	5
Week 5	1	3	4
Total	17 (53%)	15 (47%)	32

Table 5 describes the details of overall homework compliance according to specific task in each week for the MAS program completer sample (*n* = 9). Homework comprised of one primary task, the 3-minute breathing space (3MBR), and one or two additional mindfulness practices for six days a week for five weeks. Over the course of the study 23% of all 3MBR were completed. During Week 1 participants completed 49%, in Week two 33%, in Week three 28%, in Week four 20% and in Week five 19% of this homework requirement. Additional homework varied from week-to-week. After the first session participants were asked to practice mindfulness during one daily task each day. They were also asked to eat one meal mindfully during the week. On average participants completed 81% of their mindful daily task homework and 33% of them ate a mindful meal.

Homework during Week 2 requested that participants become aware of a single pleasant event every day and report these observations in the pleasant event calendar. They were also asked to complete the body scan daily for 10 minutes. Participants completed 59% of the pleasant events calendar and 57% of the body scan homework. In Week 3 participants were asked to become aware of a single negative event each day and to report on it in the negative

event calendar. Additionally, they were expected to practice the mindfulness of the breath meditation once a day for 15 minutes. Participants completed 46% of the negative events calendar and practiced 43% of the assigned mindfulness of breath meditation. During Week 4 participants were requested to incorporate the 15-minute seated mindfulness meditation into their daily routine. Compliance with this homework was 33%. In Week 5 participants were expected to continue practicing the seated mindfulness meditation. They were also invited to practice the 3-minute coping breathing space (3MCBS) once a day. Participants completed 31% of the seated mindfulness meditation and practiced 9% of the assigned 3MCBS. Overall participants completed 32% of all homework, 38% less than the minimum (70%) feasibility requirement. During Week one 56%, in Week two 51%, in Week three 41%, in Week four 24%, in Week five 16% of this homework was completed.

Since mindfulness meditation is emphasized as the primary practice (Kabat-Zinn, 1995; Segal et al., 2002) we decided to separately investigate the amount of time students spent in meditation. Our meditation specific homework tasks allowed students to practice the maximum of 600 minutes of meditation during the five homework weeks. The total amount of time spent in mindfulness meditation (600 minutes) was determined by combining all time requirements of each meditation task. Students completed in total 170 minutes (28%) of the assigned meditation.

Table 5

Homework Task Completion and Homework Compliance Rate in the MAS Program Completer Sample

Homework	Week 1	Week 2	Week 3	Week 4	Week 5	Total
3MBS (3/day; 18/week)	49%	33%	28%	20%	19%	23%
Daily task (1/day; 6/week)	81%	—	—	—	—	81%
Meal (1/week)	33%	—	—	—	—	33%
Positive Events (1/day; 6/week)	—	59%	—	—	—	59%
Body Scan (1/day; 6/week)	—	57%	—	—	—	57%
Negative Events (1/day; 6/week)	—	—	46%	—	—	46%
Mindfulness of Breath (1/day; 6/week)	—	—	43%	—	—	43%
Seated Meditation (1/day; 6/week)	—	—	—	33%	31%	32%
3CBS (1/day; 6/week)	—	—	—	—	9%	9%
Total	56%	51%	41%	24%	16%	32%

Note. The total value is calculated based on the maximum number of potential homework that could have been completed during the week by MAS program completers (n = 9). In Week one homework was 25 tasks, in Week two, three and five 30 tasks, and in Week four 24 tasks, totalling to 139 potential homework tasks available for completion.

The maximum amount of homework tasks completed on an individual level was 57% and meditation was 55% (see Table 6). Therefore, no participant completed 70% of the homework. However, it is important to mention that these results might not be accurate. Some participants indicated that they did do their homework, but forgot to log it online or bring in their paper logs to the sessions. This would suggest that potentially more homework was completed than accounted for in this study. On the other hand some participants were filling out their logs at the beginning of the session, suggesting that retrospective recall may have biased the accuracy of those reports.

Finally, because previous research indicates that participants who complete mindfulness-based programs tend to be older than those who dropout (Crane & Williams, 2010) we investigated whether demographic characteristics were correlated with MAS program compliance. Accordingly, we performed Pearson's correlations between participants' age, academic status, gender, and session attendance, homework tasks completion, and the amount of time they spent in formal mindfulness practice. Table 6 provides individual demographic information and compliance rates of our completer sample, while Table 7 provides these intercorrelations.

MAS program participants age, academic status, or gender was not significantly correlated with their session attendance, homework tasks completion or the amount of time they spent meditating. Compliance with session attendance was positively correlated with homework tasks completion ($r = .84$, $p < .01$) and with the amount of time students spent meditating ($r = .68$, $p = .04$). This suggests that students who attended more sessions were also more likely to do more homework and practice more meditation. Homework completion was also positively correlated ($r = .95$, $p < .01$). with the amount of time students spent meditating.

Table 6

Participants' Age and Compliance with Session Attendance, Homework Completion and Practice of Meditation in the MAS Program Completer Sample

Age	Academic status	Gender	Attendance	Homework tasks completed	Percentage of total time spent meditating
20	Undergraduate	Male	100%	40%	27%
22	Undergraduate	Female	83%	15%	10%
23	Undergraduate	Female	83%	39%	36%
25	Graduate	Female	100%	53%	50%
29	Graduate	Male	100%	39%	24%
29	Graduate	Female	100%	57%	55%
30	Undergraduate	Female	66%	20%	18%
31	Graduate	Female	66%	11%	8%
40	Graduate	Female	83%	32%	24%

Note. Values are calculated based on the maximum number of session attendance (6), homework tasks (139) and meditation time (600 minutes) each participant could complete during the five weeks of reporting period.

Table 7

Interrcorrelations Between Age and Compliance with Attendance, Homework and Meditation in the MAS Program Completer Sample

	1	2	3	4	5	6
1. Age	—					
2. Academic status	.61	—				
3. Gender	.17	.32	—			
4. Attendance compliance	-.33	.25	-.10	—		
5. Homework compliance	-.14	.32	-.05	.84**	—	
6. Meditation compliance	-.12	.31	.24	.68*	.95**	—

Note. * $p < .05$, ** $p < .01$

Baseline Measures

One-way ANOVA was used to test for difference between the study groups on baseline levels of psychological distress (DASS), mindfulness (TMS), executive functioning (BDEFS-LF), academic functioning (LASSI), ADHD (ASRS) and attention (MWT). No significant difference in these baseline measures was noted across the two conditions suggesting our randomization procedure was successful (see Table 8). However, the LASSI subscale measuring self-testing, $F(1, 38) = 6.26$, $p = .02$ and test strategies, $F(1, 38) = 4.20$, $p = .05$ was significantly different across the two conditions.

Table 8

Mean (SD) Baseline Values for Study Outcomes

	MAS program (*n* = 20)	WL (*n* = 20)	
	M ± *SD*	*M* ± *SD*	*p*
TMS			
State mindfulness	38.15 ± 7.73	39.75 ± 8.32	.53
Curiosity	18.55 ± 3.55	20.00 ± 4.04	.23
De-centering	19.60 ± 5.69	19.75 ± 6.32	.94
BDEFS-LF			
Self-management	60.75 ± 11.38	60.35 ± 12.77	.92
Self-organization[a]	55.68 ± 11.30	58.00 ± 14.82	.59
Self-restraint[a]	43.58 ± 10.74	38.80 ± 13.09	.22
Self-motivation	27.45 ± 9.32	29.30 ± 9.01	.53
Self-regulation of emotions	30.50 ± 6.92	29.95 ± 10.20	.84
EF deficits	40.75 ± 16.66	40.20 ± 19.45	.92
BDEFS ADHD[a]	23.00 ± 4.63	22.10 ± 5.15	.57
BDEFS total[a]	220.16 ± 37.01	216.40 ± 47.47	.78

(Continued on next page)

Table 8

Mean (SD) Baseline Values for Study Outcomes (Continued)

	MAS program (*n* = 20)	WL (*n* = 20)	
	M ± *SD*	*M* ± *SD*	*p*
ASRS (ADHD)			
DSM-IV-TR	3.10 ± 0.79	2.65 ± 1.39	.21
Additional cues	38.90 ± 5.90	38.75 ± 7.16	.94
MWT			
Mind wandering[a]	9.25 ± 1.83	9.74 ± 1.76	.40
Attention	8.90 ± 1.71	10.05 ± 2.23	.08
DASS			
Depression[b]	13.70 ± 8.89	15.05 ± 8.68	.86
Anxiety	10.50 ± 6.62	11.90 ± 9.79	.60
Stress	19.30 ± 7.95	17.85 ± 9.35	.60
DASS total	43.50 ± 20.82	44.80 ± 24.04	.86
LASSI			
Anxiety	21.50 ± 8.15	18.70 ± 6.88	.25
Attitude	29.40 ± 4.42	29.45 ± 5.42	.97
Concentration	19.35 ± 6.64	18.20 ± 5.22	.55
Information processing	26.25 ± 5.83	26.30 ± 6.06	.98
Motivation	26.35 ± 5.69	24.25 ± 6.73	.29
Self-testing	20.80 ± 6.83	16.10 ± 4.90	.02
Study aids	23.85 ± 6.43	21.90 ± 5.85	.32
Selecting main ideas	26.10 ± 7.64	22.60 ± 6.51	.13
Time management	17.85 ± 5.69	19.05 ± 5.09	.49
Test strategies	27.20 ± 6.34	23.35 ± 5.51	.05

Note. TMS Toronto Mindfulness Scale (scale range 13-65), *BDEFS-LF* Barkley Deficit in Executive Functioning Scale-Long From (scale range 89-356, subscale range varies), *ASRS* ADHD Self-Report Scale (scale range 18-90), *MWT* Mind Wandering Task (scale range 0-7), *DASS* Depression Anxiety and Stress Scale (scale range 0-126, subscale range 0-42), *LASSI* The Learning and Study Strategies Inventory (scale range 80-400, subscale range 8-40); Unless otherwise specified degrees of freedom for ANOVAs are $F(1, 38)$; [a]Due to missing data the degrees of freedom is $F(1, 37)$; [b]Baseline depressions scores were log transferred in order to remove the significant skew, which was larger than the recommended $Z = 2.58$ at $p < .05$.

One-way ANOVAs were used to assess differences between MAS program completion status (Completer versus Dropout) on baseline outcomes. Analyses did not reveal significant differences between completers and dropouts for any baseline measure, suggesting cognitive and psychological characteristics of participants did not influence the dropout risk (see Table 9).

Table 9

Mean (SD) Baseline Outcome Scores for Completers and Dropouts

	Completer (*n* = 25)	Dropout (*n* = 15)	
	M ± *SD*	*M* ± *SD*	*p*
TMS			
State mindfulness	37.88 ± 7.86	40.73 ± 8.10	.28
Curiosity	18.76 ± 3.26	20.13 ± 4.61	.28
De-centering	19.12 ± 6.05	20.60 ± 5.83	.45
BDEFS-LF			
Self-management	62.72 ± 11.97	56.93 ± 11.36	.14
Self-organization[a]	55.28 ± 13.26	59.71 ± 12.79	.32
Self-restraint[a]	39.28 ± 11.76	44.43 ± 12.39	.21
Self-motivation	30.00 ± 9.16	25.67 ± 8.61	.15
Self-regulation of emotions	29.00 ± 9.57	32.27 ± 6.51	.25
EF deficits	40.32 ± 18.55	40.73 ± 17.33	.94
BDEFS ADHD[a]	22.24 ± 4.86	23.07 ± 5.00	.61
BDEFS total[a]	216.28 ± 46.51	221.71 ± 34.46	.70
ASRS (ADHD)			
DSM-IV-TR	3.12 ± 1.13	2.47 ± 1.06	.08
Additional cues	39.00 ± 6.73	38.53 ± 6.25	.83
MWT			
Mind wandering[a]	9.44 ± 1.92	9.57 ± 1.60	.83
Attention	9.48 ± 2.27	9.47 ± 1.68	.98
DASS			
Depression[b]	15.00 ± 9.96	13.33 ± 6.23	.98
Anxiety	11.84 ± 9.17	10.13 ± 6.70	.53
Stress	17.64 ± 9.47	20.13 ± 6.93	.38
DASS total	44.48 ± 25.45	43.60 ± 16.12	.90

(Continued on next page)

Table 9

Mean (SD) Baseline Outcome Scores for Completers and Dropouts (Continued)

	Completer (*n* = 25)	Dropout (*n* = 15)	
	M ± *SD*	*M* ± *SD*	*p*
LASSI			
Anxiety	21.36 ± 8.59	18.00 ± 5.08	.18
Attitude	29.56 ± 4.92	29.20 ± 4.97	.82
Concentration	18.60 ± 6.06	19.07 ± 5.88	.81
Information processing	25.84 ± 5.56	27.00 ± 6.49	.55
Motivation	25.28 ± 6.86	25.33 ± 5.27	.98
Self-testing	17.96 ± 7.29	19.27 ± 4.38	.53
Study aids	22.40 ± 6.42	23.67 ± 5.79	.53
Selecting main ideas	24.08 ± 7.47	24.80 ± 7.03	.76
Time management	18.20 ± 5.96	18.87 ± 4.36	.71
Test strategies	24.88 ± 6.73	25.93 ± 5.27	.61

Note. TMS Toronto Mindfulness Scale (scale range 13-65), *BDEFS-LF* Barkley Deficit in Executive Functioning Scale-Long From (scale range 89-356, subscale range varies), *ASRS* ADHD Self-Report Scale (scale range 18-90), *MWT* Mind Wandering Task (scale range 0-7), *DASS* Depression Anxiety and Stress Scale (scale range 0-126, subscale range 0-42), *LASSI* The Learning and Study Strategies Inventory (scale range 80-400, subscale range 8-40); Unless otherwise specified degrees of freedom for ANOVAs are $F(1, 38)$; [a]Due to missing data the degrees of freedom is $F(1, 37)$; [b]Baseline depressions scores were log transferred in order to remove the significant skew, which was larger than the recommended $Z = 2.58$ at $p < .05$.

Preliminary Efficacy of the MAS Program—Correlation Analysis

We expected that mindfulness scores (TMS) would be related to scores on measures of executive functioning (BDEFS-LF), ADHD (ASRS), mind wandering (MWT), attention (MWT2), psychological distress (DASS), and academic functioning (LASSI). Furthermore, we expected to see relationships between the BDEFS-LF, ASRS, MWT, MWT2, DASS and LASSI scores to support the theoretical foundation of this study, which suggest that academic functioning is influenced by EF and psychological distress. Because a more in-depth analysis of each subscale is provided in the ensuing section, correlations were performed only on total scale scores. ASRS and LASSI composite scores were calculated for this purpose. Table 10 describes

intercorrelations among baseline measures for the total sample and post-study measures for the intent-to-treat and completer samples.

Baseline measures. TMS scores were positively correlated with DASS scores ($r = .51$, $p < .01$). This suggests that students who experienced more psychological distress were more mindful of their experiences. BDEFS-LF scores were positively correlated with ASRS scores ($r = .59$, $p < .01$) and negatively correlated with LASSI scores ($r = -.62$, $p < .01$), indicating that students who experience higher level of EF deficits were also likely to experience more attention deficit problems and have lower academic functioning. ASRS scores were positively correlated with DASS scores ($r = .44$, $p < .01$) and negatively correlated with LASSI scores ($r = -.36$, $p < .05$), indicating that students who experience more attention deficit problems were also likely to experience more psychological distress and have lower academic functioning. MWT scores were positively correlated with MWT2 scores ($r = .59$, $p < .01$), indicating that students who experience more mind wandering were also likely to experience more problems paying attention to presented information.

Post-study. As shown in Table 10, correlation analyses conducted on post-study outcomes revealed a generally similar pattern of significant associations as the pre-study outcomes described above. In addition, for both the ITT and completer sample, post-study scores on the BDEFS-LF and the DASS were positively correlated ($r = .44$, $p < .01$ and $r = .65$, $p < .01$, respectively), whereas scores on the LASSI and DASS were negatively correlated ($r = -.41$, $p < .01$ and $r = -.50$, $p < .01$, respectively). Finally, analyses revealed that for the completer sample only, post-study scores on the LASSI and the MWT were negatively correlated ($r = -.41$, $p < .05$), while score the ASRS and DASS were positively correlated ($r = .41$, $p < .05$). In conclusion, intercorrelations in this study indicated that students who experienced EF deficits

were also likely to have more ADHD symptoms, lower moods, and increased difficulties with their academic functioning.

Table 10

Intercorrelations Between Measures at Baseline and Post-Study Assessment for the Intent-To-Treat and Completer Sample

Scales	TMS	BDEFS-LF	ASRS	MWT	MWT2	DASS	LASSI
TMS							
Baseline	—						
Post-ITT	—						
Post-Comp	—						
BDEFS-LF							
Baseline	.15	—					
Post-ITT	.13	—					
Post-Comp	.03	—					
ASRS							
Baseline	.19	.59**	—				
Post-ITT	-.01	.57**	—				
Post-Comp	.05	.68**	—				
MWT							
Baseline	.01	.10	.24	—			
Post-ITT	-.04	.18	.26	—			
Post-Comp	-.02	.35	.35	—			
MWT2							
Baseline	-.11	-.05	.06	.59**	—		
Post-ITT	-.36	.17	.17	.58**	—		
Post-Comp	.04	.28	.16	.51**	—		
DASS							
Baseline	.51**	.29	.44**	.21	.03	—	
Post-ITT	.14	.44**	.24	.14	.22	—	
Post-Comp	.17	.65**	.41*	.18	.32	—	
LASSI							
Baseline	-.02	-.62**	-.36*	-.21	-.18	-.12	—
Post-ITT	-.09	-.74**	-.48**	-.22	-.18	-.41**	—
Post-Comp	.06	-.76**	-.63**	-.41*	-.34	-.50*	—

Note. *$p < .05$, ** $p < .01$; *TMS* Toronto Mindfulness Scale, *BDEFS-LF* Barkley Deficit in Executive Functioning Scale-Long From, *ASRS* ADHD Self-Report Scale, *MWT* Mind Wandering Task, *MWT2* Attention, *DASS*

Depression Anxiety and Stress Scale, *LASSI* The Learning and Study Strategies Inventory, *Post-ITT* Post measure of intent-to-treat sample*, Post-Comp* post-measure of completer sample.

Preliminary Efficacy of the MAS Program—Group Comparison

Preliminary efficacy results are provided for both the intent-to-treat and completer samples. One-way analysis of covariance (ANCOVA) was used to compare the study conditions at Week 6, with the baseline score of each measure used as a covariate. Students in the WL condition did not engage in any extracurricular activity that could have influenced their results. Table 11 describes the ANCOVA results for both the intent-to-treat and completer sample. Table 12 provides information about means, standard deviations and within- and between-group effect sizes for the intent-to-treat sample. Table 13 offers the same information for the completer sample.

Manipulation Check. We expected that the MAS program would increase participants' mindfulness, curiosity and decentering relative to the WL control condition. The analysis evaluating the homogeneity-of-regression (slopes) assumption of the ANCOVA indicated that the relationship between the covariate and the dependent variable (mindfulness) did not differ significantly as a function of the independent variable, $F(1, 36) = 2.22$, $p = .15$. The assumption of homogeneity of variance for the ANCOVA was also met, $F(1, 38) = 0.02$, $p = .88$. The covariate was marginally related to the dependent variable, $F(1, 37) = 3.87$, $p = .06$, confirming a relationship between baseline and post-measure scores of mindfulness. These results indicate that all the assumptions of the ANCOVA were met for TMS total score.

The analysis evaluating the homogeneity-of-regression (slopes) assumption of the ANCOVA indicated that the relationship between the covariate and the TMS curiosity subscale differed significantly as a function of the independent variable, $F(1, 36) = 5.36$, $p = .03$. Due to the robust nature of the ANCOVA we preceded with the analysis for this subscale. All other assumptions of the ANCOVA were met for the TMS subscales.

Mindfulness. Contrary to expectations, the ANCOVA did not reveal a significant intervention effect for the TMS total score, $F(1, 37) = 0.01$, $p = .90$, or for the curiosity, $F(1, 37) = 0.68$, $p = .41$, and decentering, $F(1, 37) = 0.62$, $p = .43$, subscales score. The between-group effect size was small for all three; TMS total score (Cohen's $d = -0.10$ [95% CI: -0.72, 0.52]), curiosity subscale (Cohen's $d = 0.09$ [95% CI: -0.53, 0.71]), and decentering subscale (Cohen's $d = -0.25$ [95% CI: -0.86, 0.37]). The within-group effect size was also small in both the MAS program (TMS total score, Cohen's $d = 0.12$; curiosity subscale, Cohen's $d = -0.25$; decentering subscale, Cohen's $d = 0.38$) and WL condition (TMS total score, Cohen's $d = 0.19$; curiosity subscale, Cohen's $d = 0.16$; decentering subscale, Cohen's $d = 0.15$). The *completer sample* produced similar results with the following exception. The between-effect size increased to medium levels (Cohen's $d = 0.56$ [95% CI: -0.27, 1.39]) for the curiosity subscale, with participants in the MAS program attaining higher scores (20.89 ± 5.53) than WL participants (18.06 ± 4.84). Although, the between group effects sizes suggest that the magnitude of differences between the MAS program and WL condition for the completer sample is meaningful, the magnitude of change in level of mindfulness from baseline to post-study for the MAS program was negligible. Overall, these results indicate that participation in the MAS program did not increase students' ability to evoke and retain attention in a given moment or their ability to look upon an experience with more disidentification.

Effect of the MAS program on EF. We expected that the MAS program would improve participants' overall EF, self-management to time, self-organization, self-restraint, self-motivation, self-regulations of their emotions, ADHD symptoms, and severity of EF deficits relative to the WL control condition. The ANCOVA assumptions of homogeneity-of-regression (slopes), homogeneity-of-variance and having a relationship between covariate and dependent

variable were met for the BDEFS-LF total score. The assumption of homogeneity of variance for the ANCOVA was not met for BDEFS-LF ADHD subscale, $F(1, 37) = 4.71$, $p = .04$. Due to the robust nature of the ANCOVA we preceded with the analysis for this subscale. All other assumptions of the ANCOVA were met for other BDEFS-LF subscales.

As expected, the ANCOVA revealed a significant intervention effect for the BDEFS-LF total score, $F(1, 36) = 10.08$, $p < .01$, with participants in the MAS program attaining lower scores (200.89 ± 39.23) than WL participants (226.50 ± 46.53). The between-group effect size was medium (Cohen's $d = -0.59$ [95% CI: -1.24, 0.05]). The within-group effect size was moderate in the MAS program (Cohen's $d = 0.50$), reducing from pre- (220.16 ± 37.01) to post-study (200.89 ± 39.23), and small in the WL condition (Cohen's $d = -0.21$). In the *completer sample,* both the between-group (Cohen's $d = -0.84$ [95% CI: -1.69, 0.01]) and within-group effect size for the MAS program (Cohen's $d = 0.94$) increased to large. These results suggest that participation in the MAS program improved students' overall EF and program completion strengthened these benefits.

Self-management to time. As expected, the ANCOVA revealed a significant intervention effect for the BDEFS-LF self-management to time subscale, $F(1, 37) = 8.09$, $p = .01$, with participants in the MAS program attaining lower scores (55.65 ± 11.65) than WL participants (63.25 ± 13.41). The between-group effect size was medium (Cohen's $d = -0.60$ [95% CI: -1.24, 0.03]). The within-group effect size was small in both the MAS program (Cohen's $d = 0.44$) and WL condition (Cohen's $d = -0.22$). Although, the between group effects sizes suggest that the magnitude of differences between the MAS program and WL condition is meaningful, the magnitude of change in self-management to time from baseline to post-study for the MAS program was small. In the *completer sample,* the effect size increased to large in the MAS

program condition (Cohen's $d = 0.44$), reducing from pre- (65.78 ± 10.67) to post-study (55.22 ± 12.09). These results suggest that participation in the MAS program improved students' ability to manage their time. Program completion strengthened these benefits.

Self-organization/problem solving. As expected, the ANCOVA revealed a significant intervention effect for the BDEFS-LF self-organization subscale, $F(1, 36) = 11.23$, $p < .01$, with participants in the MAS program attaining lower scores (50.79 ± 13.36) than WL participants (61.35 ± 14.13). The between-group effect size was medium (Cohen's $d = -0.77$ [95% CI: -1.42, 0.12]). The within-group effect size was small in both the MAS program (Cohen's $d = 0.38$) and WL condition (Cohen's $d = -0.24$). Although, the between group effects sizes suggest that the magnitude of differences between the MAS program and WL condition is meaningful, the magnitude of change in self-organization from baseline to post-study for the MAS program was small. In the *completer sample,* the between-group effect size increased to large (Cohen's $d = -1.08$ [95% CI: -1.95, -0.21]). The within-group effect size also increased to large in the MAS program condition (Cohen's $d = 0.94$), reducing from pre- (54.89 ± 9.24) to post-study (45.33 ± 10.93). These results suggest that participation in the MAS program improved students' ability to overcome obstacles of goal attainment. Program completion strengthened these benefits.

Self-restraint (inhibition). Contrary to expectations, the ANCOVA did not reveal a significant intervention effect for the BDEFS-LF self-restraint subscale, $F(1, 36) = 1.52$, $p = .23$. The between-group effect size was small (Cohen's $d = 0.08$ [95% CI: -0.55, 0.71]). The within-group effect size was also small in both the MAS program (Cohen's $d = 0.23$) and WL condition (Cohen's $d = -0.09$). The *completer sample* produced similar results. These results suggest that

participation in the MAS program did not improve students' ability to restrain themselves from inappropriate cognitive, behavioral, verbal, or emotional reactions.

Self-motivation to goal attainment. As expected, the ANCOVA revealed a significant intervention effect for the BDEFS-LF self-motivation subscale, $F(1, 37) = 7.92$, $p = .01$, with participants in the MAS program attaining lower scores (25.10 ± 8.58) than WL participants (31.45 ± 7.99). The between-group effect size was medium (Cohen's $d = -0.77$ [95% CI: -1.41, 0.12]). The within-group effect size was small in both the MAS program (Cohen's $d = 0.26$) and WL condition (Cohen's $d = -0.25$). Although, the between group effects sizes suggest that the magnitude of differences between the MAS program and WL condition is meaningful, the magnitude of change in self-motivation from baseline to post-study for the MAS program was small. In the *completer sample,* the within-group effect size increased to medium in the MAS program condition (Cohen's $d = 0.64$), reducing from pre- (30.89 ± 8.89) to post-study (25.33 ± 8.54). These results suggest that participation in the MAS program improved students' ability to persevere in face of difficulties. Program completion strengthened these benefits.

Self-regulation of emotions. As expected, the ANCOVA revealed a significant intervention effect for the BDEFS-LF self-regulation of emotions subscale, $F(1, 37) = 4.87$, $p = .03$, with participants in the MAS program attaining lower scores (26.70 ± 5.73) than WL participants (30.40 ± 8.00). The between-group effect size was medium (Cohen's $d = -0.53$ [95% CI: -1.16, 0.10]), suggesting that the magnitude of effect is meaningful. The within-group effect size was medium in the MAS program condition (Cohen's $d = 0.59$), reducing from pre- (30.50 ± 6.92) to post-study (26.70 ± 5.73), and small in the WL condition (Cohen's $d = -0.05$). In the *completer sample,* the within-group effect size increased to large in the MAS program condition

(Cohen's d = 1.06). These results suggest that participation in the MAS program improved students' ability to regulate their emotions. Program completion strengthened these benefits.

EF related ADHD symptoms. As expected, the ANCOVA revealed a marginally significant intervention effect for the BDEFS-LF ADHD subscale, $F(1, 36) = 3.88$, $p = .06$, with participants in the MAS program attaining lower scores (21.58 ± 5.01) than WL participants (23.00 ± 4.87). The between-group effect size was small (Cohen's d = -0.29 [95% CI: -0.93, 0.35]). The within-group effect size was also small in both the MAS program (Cohen's d = 0.29) and WL condition (Cohen's d = -0.18). In the *completer sample,* the intervention effect for ADHD subscale of BDEFS-LF, $F(1, 22) = 6.19$, $p = .02$, became significant. The between-group effect size increased to medium (Cohen's d = -0.58 [95% CI: -1.41, 0.25]), suggesting that the magnitude of effect is meaningful. The within-group effect size also increased to medium in the MAS program condition (Cohen's d = 0.63), reducing from pre- (23.22 ± 4.94) to post-study (20.00 ± 5.31). These results suggest that participation in the MAS program reduced students' EF related ADHD symptoms. Program completion strengthened these benefits.

EF deficits. As expected, the ANCOVA revealed a significant intervention effect for the BDEFS-LF EF deficits subscale, $F(1, 37) = 9.23$, $p < .01$, with participants in the MAS program attaining lower scores (32.85 ± 18.11) than WL participants (44.45 ± 20.37). The between-group effect size was medium (Cohen's d = -0.60 [95% CI: -1.23, 0.03]). The within-group effect size was small in both the MAS program (Cohen's d = 0.45) and WL condition (Cohen's d = -0.21). Although, the between group effects sizes suggest that the magnitude of differences between the MAS program and WL condition is meaningful, the magnitude of change from baseline to post-study for the MAS program was small. In the *completer sample,* the between-group effect size increased to large (Cohen's d = -0.94 [95% CI: -1.80, 0.09]). The within-group effect size also

increased to large in the MAS program condition (Cohen's *d* = 1.18), reducing from pre- (43.11 ± 14.67) to post-study (25.11 ± 15.81). These results suggest that participation in the MAS program reduced the severity of students' EF deficits. Program completion strengthened these benefits.

Effect of the MAS program on ADHD. We expected that the MAS program would reduce participants' attention deficit related symptoms, relative to the WL control condition. The ANCOVA assumptions of homogeneity-of-regression (slopes), homogeneity-of-variance and having a relationship between covariate and dependent variable were met for all ADHD measures.

DSM-IV-TR highly consistent symptom with ADHD. Contrary to expectations, the ANCOVA did not reveal a significant intervention effect for the ASRS subscale indicating symptoms highly consistent with ADHD, $F(1, 37) = 3.15$, $p = .08$, but a trend in the expected direction was noted. The between-group effect size was small (Cohen's *d* = -0.22 [95% CI: -0.84, 0.40]). The within-group effect size was also small in both the MAS program (Cohen's *d* = 0.45) and WL condition (Cohen's *d* = -.17). However, in the *completer sample,* the ANCOVA revealed a significant intervention effect for ASRS subscale indicating symptoms highly consistent with ADHD, $F(1, 22) = 4.53$, $p = .04$, with participants in the MAS program attaining lower scores (2.33 ± 1.58) than WL participants (3.13 ± 1.36). The between-group effect size increased to medium (Cohen's *d* = -0.55 [95% CI: -1.39, 0.28]), suggesting that the magnitude of effect is meaningful. The within-group effect size became large in the MAS program condition (Cohen's *d* = 0.84), reducing from pre- (3.44 ± 0.73) to post-study (2.33 ± 1.58) and remained small in the WL condition (Cohen's *d* = -0.14). These results suggest that

when students completed the MAS program their self-report DSM-IV-TR related ADHD symptoms decreased.

DSM-IV-TR additional cues of ADHD. As expected, the ANCOVA revealed a significant intervention effect for ASRS subscale indicating additional cues of ADHD, $F(1, 37) = 8.29$, $p = .01$, with participants in the MAS program attaining lower scores (36.05 ± 6.82) than WL participants (39.75 ± 6.66). The between-group effect size was medium (Cohen's $d = -0.55$ [95% CI: -1.18, 0.08]). The within-group effect size was small in both the MAS program (Cohen's $d = 0.44$) and WL condition (Cohen's $d = -0.14$). Although, the between group effects sizes suggest that the magnitude of differences between the MAS program and WL condition is meaningful, the magnitude of change from baseline to post-study for the MAS program was small. In the *completer sample,* the between-group effect size increased to large (Cohen's $d = -0.88$ [95% CI: -1.74, -0.03]). The within-group effect size also became large in the MAS program condition (Cohen's $d = 0.81$), reducing from pre- (39.44 ± 5.90) to post-study (34.11 ± 7.06). These results suggest that participation in the MAS program reduced students' symptoms that provide additional information about their level of ADHD. Program completion strengthened these benefits.

Effect of the MAS program on mind wandering. We expected that the MAS program would reduce participants' mind wandering relative to the WL control condition. The ANCOVA assumptions of homogeneity-of-regression (slopes), homogeneity-of-variance and having a relationship between covariate and dependent variable were met for the mind wandering and for the attention measures.

Contrary to expectations, the ANCOVA did not reveal a significant intervention effect for MWT score, $F(1, 36) = 0.01$, $p = .90$. The between-group effect size was small (Cohen's

d = -0.25 [95% CI: -0.88, 0.38]). The within-group effect size was also small in both the MAS program (Cohen's *d* = 0.22) and WL condition (Cohen's *d* = 0.23). However**,** in the *completer sample,* the ANCOVA revealed a marginally significant intervention effect for MWT score $F(1, 22) = 3.55$, $p = .07$, with participants in the MAS program attaining lower scores (7.56 ± 1.01) than WL participants (9.50 ± 2.00). The between-group effect size became large (Cohen's *d* = -1.13 [95% CI: -2.00, -0.25]), suggesting that the magnitude of effect is meaningful. The within-group effect size became medium in the MAS program condition (Cohen's *d* = 0.65) and remained small in the WL condition (Cohen's *d* = 0.23). These results suggest that when students completed the MAS program their mind wandering decreased.

Attention. Contrary to expectations, the ANCOVA did not reveal a significant intervention effect for MWQ2 score, $F(1, 37) = 0.48$, $p = .49$. The between-group effect size was small (Cohen's *d* = -0.22 [95% CI: -0.84, 0.40]). The within-group effect size was small in both the MAS program (Cohen's *d* = -0.06) and WL condition (Cohen's *d* = 0.31). In the *completer sample,* the between-group effect size increased to large (Cohen's *d* = -0.98 [95% CI: -1.84, -0.12]). The within-group effect size remained small in both the MAS program (Cohen's *d* = 0.00) and WL condition (Cohen's *d* = 0.37). Although, the between group effects sizes suggest that the magnitude of differences between the MAS program and WL condition is meaningful, no change was observed from baseline to post-study for the MAS program. These results suggest that participation in the MAS program did not improve students' ability to pay attention to presented information.

Effect of the MAS program on psychological distress. We expected that the MAS program would reduce participants' psychological distress; depression, anxiety, and stress relative to the WL control condition. The ANCOVA assumptions of homogeneity-of-regression

(slopes), homogeneity-of-variance and having a relationship between covariate and dependent variable were met for the DASS total score and subscale scores.

Contrary to expectations, the ANCOVA did not reveal a significant intervention effect for the DASS total score, $F(1, 37) = 1.46$, $p = .23$. The between-group effect size was small (Cohen's $d = -0.38$ [95% CI: -1.01, 0.24]). The within-group effect size was also small in both the MAS program (Cohen's $d = 0.32$) and WL condition (Cohen's $d = -0.04$). However, in the *completer sample,* the ANCOVA revealed a significant intervention effect on the DASS total score, $F(1, 22) = 4.14$, $p = .05$, with participants in the MAS program attaining lower scores (30.22 ± 18.28) than WL participants (48.06 ± 26.16). The between-group effect size became medium (Cohen's $d = -0.75$ [95% CI: -1.60, 0.09]), suggesting that the magnitude of effect is meaningful. The within-group effect size was medium in the MAS program condition (Cohen's $d = 0.66$), decreasing from pre- (46.44 ± 29.42) to post-study (30.22 ± 18.28) and small in the WL condition (Cohen's $d = -0.19$). These results suggest that when students completed the MAS program their psychological distress reduced.

Depression. Contrary to expectations, the ANCOVA did not reveal a significant intervention effect for the DASS depression subscale, $F(1, 37) = 2.03$, $p = .17$. The between-group effect size was small (Cohen's $d = -0.47$ [95% CI: -1.10, 0.16]). The within-group effect size was also small for in both the MAS program (Cohen's $d = 0.33$) and WL condition (Cohen's $d = -0.01$). However, in the *completer sample,* the ANCOVA revealed a marginally significant intervention effect for depression subscale of DASS, $F(1, 22) = 4.06$, $p = .06$, with participants in the MAS program attaining lower scores (8.22 ± 6.87) than WL participants (16.69 ± 10.96). The between-group effect size was large (Cohen's $d = -0.87$ [95% CI: -1.72, -0.02]), suggesting that the magnitude of effect is meaningful. The within-group effect size was medium in the MAS

program condition (Cohen's *d* = 0.57), reducing from pre- (14.56 ± 11.85) to post-study (8.22 ± 6.87). This effect size was small in the WL condition (Cohen's *d* = -0.14). These results suggest that when students completed the MAS program their level of depression reduced.

Anxiety. Contrary to expectations, the ANCOVA did not reveal a significant intervention effect for the DASS anxiety subscale, $F(1, 37) = 0.46$, $p = .50$. The between-group effect size was small (Cohen's *d* = -0.27 [95% CI: -0.90, 0.35]). The within-group effect size was also small in both the MAS program (Cohen's *d* = 0.07) and WL condition (Cohen's *d* = -0.04). In the *completer sample,* the between-group effect size increased to medium (Cohen's *d* = -0.54 [95% CI: -1.37, 0.29]), with participants in the MAS program attaining lower scores (9.11 ± 7.08) after the intervention than the WL participants (13.50 ± 8.69). However, the within-group effect size remained small in both the MAS program (Cohen's *d* = 0.31) and WL condition (Cohen's *d* = -0.15). Although, the between group effects sizes suggest that the magnitude of differences between the MAS program and WL condition is meaningful, the magnitude of change in anxiety from baseline to post-study for the MAS program was small.

Stress. Contrary to expectations, the ANCOVA did not reveal a significant intervention effect for DASS stress subscale, $F(1, 37) = 1.02$, $p = .32$. The between-group effect size was small (Cohen's *d* = -0.22 [95% CI: -0.84, 0.40]). The within-group effect size was also small in both the MAS program (Cohen's *d* = 0.38) and WL condition (Cohen's *d* = -0.44). In the *completer sample,* the ANCOVA revealed a marginally significant intervention effect for DASS stress subscale, $F(1, 22) = 4.04$, $p = .06$, with participants in the MAS program attaining lower scores (12.89 ± 7.69) after the intervention than the WL participants (17.88 ± 9.46). The between-group effect size was medium (Cohen's *d* = -0.56 [95% CI: -1.39, 0.27]), suggesting that the magnitude of effect is meaningful. The within-group effect size was medium in the MAS

program condition (Cohen's $d = 0.79$) reducing from pre- (20.44 ± 11.39) to post-study (12.89 ± 7.69), while the effect size remained small in the WL condition (Cohen's $d = -0.20$). These results suggest that when students completed the MAS program their level of stress reduced.

Effect of the MAS program on academic functioning. We expected that the MAS program would improve academic functions as measured by changes in the LASSI subscales academic: anxiety, attitude, concentration, information processing, motivation, self-testing, study aids, selecting main idea, test strategies, and time management, relative to the WL control condition. The ANCOVA assumptions of homogeneity-of-regression (slopes), homogeneity-of-variance and having a relationship between covariate and dependent variable were met for LASSI subscales. The assumption of homogeneity of variance for the ANCOVA was not met for the LASSI study aids subscale, $F(1, 38) = 5.58$, $p = .02$. Due to the robust nature of the ANCOVA we preceded with the ANCOVA analysis for this subscale. The ANCOVA assumptions of homogeneity-of-regression (slopes), homogeneity-of-variance and having a relationship between covariate and dependent variable were met for all other LASSI subscales.

Academic anxiety. Contrary to expectations, the ANCOVA did not reveal a significant intervention effect for LASSI academic anxiety subscale, $F(1, 37) = 1.09$, $p = .30$. The between-group effect size was medium (Cohen's $d = 0.50$ [95% CI: -0.13, 1.13]), with participants in the MAS program attaining higher scores (23.55 ± 8.66) than WL participants (19.60 ± 6.99). The within-group effect size was small in both the MAS program (Cohen's $d = -0.24$) and WL condition (Cohen's $d = -0.13$). These results suggest that participation in the MAS program did not reduce students' academic performance related anxiety. In the *completer sample,* the ANCOVA revealed a significant intervention effect for LASSI academic anxiety subscale, $F(1, 22) = 5.28$, $p = .03$, with participants in the MAS program attaining higher scores

(29.56 ± 8.25) than WL participants (19.88 ± 7.75). The between-group effect size became large (Cohen's *d* = 1.22 [95% CI: 0.34, 2.10]), but the within-group effect size remained small. Although, the between group effects sizes suggest that the magnitude of differences between the MAS program and WL condition is meaningful, the magnitude of change from baseline to post-study for the MAS program remained small. These results suggest that when students completed the MAS program their level of tension and concern about their academic performance decreased, but changes did not reach meaningful levels.

Attitude. Contrary to expectations, the ANCOVA did not reveal a significant intervention effect for LASSI attitude subscale, $F(1, 37) = 0.01$, $p = .91$. The between-group effect size was small (Cohen's *d* = -0.04 [95% CI: -0.65, 0.58]). The within-group effect size was also small in both the MAS program (Cohen's *d* = -0.13) and WL condition (Cohen's *d* = -0.14). The *completer sample* had similar results. These results suggest that participation in the MAS program did not improve students' attitude toward successfully completing their degree.

Concentration. Contrary to expectations, the ANCOVA did not reveal a significant intervention effect for LASSI concentration subscale, $F(1, 37) = 1.53$, $p = .22$. The between-group effect size was small (Cohen's *d* = 0.41 [95% CI: -0.21, 1.04]). The within-group effect size was also small in both the MAS program (Cohen's *d* = -0.33) and WL condition (Cohen's *d* = -0.17). In the *completer sample,* the ANCOVA revealed a significant intervention effect for LASSI concentration subscale, $F(1, 22) = 5.18$, $p = .03$, with participants in the MAS program attaining higher scores (23.67 ± 5.59) than WL participants (19.44 ± 5.66). The between-group effect size was medium (Cohen's *d* = 0.75 [95% CI: -0.09, 1.59]), suggesting that the magnitude of effect is meaningful. The within-group effect size was medium in the MAS program condition (Cohen's *d* = -0.73), increasing from pre- (18.78 ± 7.03) to post-study (23.67 ± 5.59). The

within-group effect size remained small in the WL condition. These results suggest that when students completed the MAS program their ability to concentrate and direct their attention to school related activities improved.

Information processing. As expected, the ANCOVA revealed a significant intervention effect for LASSI information processing subscale, $F(1, 37) = 6.17$, $p = .02$, with participants in the MAS program attaining higher scores (28.15 ± 5.88) than WL participants (25.20 ± 5.98). The between-group effect size was small (Cohen's $d = 0.49$ [95% CI: -0.13, 1.13]). The within-group effect size was small in both the MAS program (Cohen's $d = -0.32$), and in WL condition (Cohen's $d = 0.18$). In the *completer sample,* the between-group effect size became large (Cohen's $d = 0.99$ [95% CI: 0.13, 1.85]), suggesting that the magnitude of effect is meaningful. The within-group effect size became medium in the MAS program condition (Cohen's $d = -0.71$), increasing from pre- (26.11 ± 5.97) to post-study (30.22 ± 5.49). The within-group effect size remained small in the WL condition. These results suggest that participation in the MAS program improved students' ability to elaborate, organize, understand, and recall academic information. Program completion strengthened these benefits.

Motivation. As expected, the ANCOVA revealed a significant intervention effect for LASSI motivation subscale, $F(1, 37) = 4.94$, $p = .03$, with participants in the MAS program attaining higher scores (27.60 ± 5.42) than WL participants (23.25 ± 6.31). The between-group effect size was medium (Cohen's $d = 0.74$ [95% CI: 0.09, 1.38]). The within-group effect size was small in both the MAS program (Cohen's $d = -0.22$) and WL condition (Cohen's $d = 0.15$). Although, the between group effects sizes suggest that the magnitude of differences between the MAS program and WL condition is meaningful, the magnitude of change from baseline to post-study for the MAS program was small. The *completer sample* produced similar results. These

results suggest that participation in the MAS program improved students' motivation to take responsibility for and to perform the tasks required for achieving academic success.

Self-testing. Contrary to expectations, the ANCOVA did not reveal a significant intervention effect for LASSI self-testing subscale, $F(1, 37) = 0.08$, $p = .77$. However, the between-group effect size was medium (Cohen's $d = 0.68$ [95% CI: 0.05, 1.32]), with participants in the MAS program attaining higher scores (21.00 ± 4.69) than WL participants (17.60 ± 5.24). The within-group effect size was small in both the MAS program (Cohen's $d = -0.03$) and WL condition (Cohen's $d = -0.08$). Although, the between group effects sizes suggest that the magnitude of differences between the MAS program and WL condition is meaningful, the magnitude of change from baseline to post-study for the MAS program was negligible. The *completer sample* produced similar results. These results suggest that participation in the MAS program did not improve students' understanding about the importance of self-testing to attain knowledge and to recall this information.

Selecting main ideas. Contrary to expectations, the ANCOVA did not reveal a significant intervention effect for LASSI selecting main ideas subscale, $F(1, 37) = 2.99$, $p = .09$, but a trend in the expected direction was noted. The between-group effect size was large (Cohen's $d = 0.73$ [95% CI: 0.09, 1.37]), with participants in the MAS program attaining higher scores (27.60 ± 6.71) than WL participants (22.80 ± 6.38). The within-group effect size was small in both the MAS program (Cohen's $d = -0.21$) and WL condition (Cohen's $d = -0.03$). Although, the between group effects sizes suggest that the magnitude of differences between the MAS program and WL condition is meaningful, the magnitude of change from baseline to post-study for the MAS program was small. In the *completer sample,* the ANCOVA revealed a significant intervention effect for LASSI selecting main ideas subscale, $F(1, 22) = 9.07$, $p = .01$, with

participants in the MAS program attaining higher scores (30.22 ± 5.97) than WL participants (22.81 ± 6.88). The between-group effect size increased to large (Cohen's *d* = 1.13 [95% CI: 0.25, 2.00]), and the within-group effect size became medium in the MAS program condition (Cohen's *d* = -0.56), increasing from pre- (26.11 ± 8.54) to post-study (30.22 ± 5.97). These results suggest that when students completed the MAS program their ability to identify the meaningful information to study improved.

Study aids. As expected, the ANCOVA revealed a significant intervention effect for LASSI study aid subscale, $F(1, 37) = 7.90$, $p = .01$, with participants in the MAS program attaining higher scores (25.70 ± 5.54) than WL participants (21.40 ± 4.44). The between-group effect size was medium (Cohen's *d* = 0.89 [95% CI: 0.25, 1.55]). The within-group effect size was small in both the MAS program (Cohen's *d* = -0.31) and WL condition (Cohen's *d* = 0.10). Although, the between group effects sizes suggest that the magnitude of differences between the MAS program and WL condition is meaningful, the magnitude of change from baseline to post-study for the MAS program was small. In the *completer sample,* the between-group effect size was similar, however, the within-group effect size became medium in the MAS program condition (Cohen's *d* = -0.65) increasing from pre- (21.56 ± 7.47) to post-study (26.00 ± 6.20). These results suggest that participation in the MAS program improved students' ability to make and use study aids that support learning and retaining information. Program completion strengthened these benefits.

Test strategies. As expected, the ANCOVA revealed a significant intervention effect for LASSI test strategy subscale, $F(1, 37) = 17.23$, $p < .01$, with participants in the MAS program attaining higher scores (29.10 ± 4.62) than WL participants (22.50 ± 4.68). The between-group effect size was large (Cohen's *d* = 1.42 [95% CI: 0.73, 2.11]). The within-group effect size was

small in both the MAS program (Cohen's d = -0.34) and WL condition (Cohen's d = 0.17). Although, the between group effects sizes suggest that the magnitude of differences between the MAS program and WL condition is meaningful, the magnitude of change from baseline to post-study for the MAS program was small. The *completer sample* produced similar results. These results suggest that participation in the MAS program improved students' ability to prepare and use test-taking strategies.

Time management. As expected, the ANCOVA revealed a significant intervention effect for LASSI time management subscale, $F(1, 37) = 7.50$, $p = .01$, with participants in the MAS program attaining higher scores (19.80 ± 5.01) than WL participants (17.40 ± 4.63). The between-group effect size was medium (Cohen's d = 0.50 [95% CI: -0.15, 1.12]). The within-group effect size was small in both the MAS program (Cohen's d = -0.36) and WL condition (Cohen's d = 0.34). Although, the between group effects sizes suggest that the magnitude of differences between the MAS program and WL condition is meaningful, the magnitude of change from baseline to post-study for the MAS program was small. In the *completer sample,* the between-group effect size reduced to small (Cohen's d = 0.38 [95% CI: -0.44, 1.20]), however, within-group effect size became medium in the MAS program condition (Cohen's d = -0.63), increasing from pre- (16.11 ± 6.79) to post-study (20.00 ± 5.52). These results suggest that participation in the MAS program improved students' ability to make and use time schedules.

Table 11

ANCOVA Results for Post-Study Scores for the Intent-To-Treat and Completer Sample

	Intent-to-treat sample (*n* = 40)								Completer sample (*n* = 25)			
	Homogeneity of regression		Homogeneity of variance		ANCOVA covariance		ANCOVA		ANCOVA covariance		ANCOVA	
	F value	*P* value	*F* value	*P* value	*F* value	*P* value	*F* value	*P* value	*F* value	*P* value	*F* value	*P* value
TMS												
Curiosity	5.36	.03	0.11	.74	7.82	.01	0.68	.41	0.00	.95	1.66	.21
De-centering	0.43	.52	0.23	.63	4.74	.04	0.62	.43	0.06	.81	0.01	.93
TMS total	2.22	.15	0.02	.88	3.87	.06	0.01	.90	0.12	.73	0.61	.44
BDEFS-LF												
Self-management	0.32	.58	0.35	.56	40.73	<.001	8.09	.01	25.27	<.001	9.24	.01
Self-organization[a]	0.30	.59	0.41	.53	74.61	<.001	11.23	.01	39.09	<.001	16.56	.001
Self-restraint**	0.33	.57	0.10	.76	67.12	<.001	1.52	.23	23.94	<.001	3.08	.09
Self-motivation	0.20	.66	0.14	.71	42.63	<.001	7.92	.01	16.25	.001	6.37	.02
Self-regulation of emotions	0.29	.59	0.79	.38	20.25	<.001	4.87	.03	13.81	.001	9.76	.005
EF deficits	0.72	.40	1.10	.30	52.78	<.001	9.23	.004	28.40	<.001	15.54	.001
BDEFS ADHD[a]	1.20	.28	4.71	.04	46.24	<.001	3.88	.06	18.42	<.001	6.19	.02
BDEFS total[a]	1.26	.27	2.79	.10	51.69	<.001	10.08	.003	30.07	<.001	14.10	.001
ASRS (ADHD)												
DSM-IV-TR	0.00	.99	0.01	.92	21.85	<.001	3.15	.08	8.61	.01	4.53	.04
Additional cues	0.11	.74	1.83	.18	61.00	<.001	8.29	.01	32.02	<.001	12.51	.002

(Continued on next page)

(Continued)	Intent-to-treat sample (n = 40)								Completer sample (n = 25)			
	Homogeneity of regression		Homogeneity of variance		ANCOVA covariance		ANCOVA		ANCOVA covariance		ANCOVA	
	F value	*P* value	*F* value	*P* value	*F* value	*P* value	*F* value	*P* value	*F* value	*P* value	*F* value	*P* value
MWT												
Mind wandering[a]	0.11	0.74	0.44	0.51	83.01	<0.001	0.01	0.90	31.64	<0.001	3.55	0.07
Attention	1.88	0.18	0.43	0.52	31.93	<0.001	0.48	0.49	6.39	0.02	0.74	0.40
DASS												
Depression[b]	0.01	.92	1.11	.30	3.62	.06	2.07	.16	2.03	.17	4.06	.06
Anxiety	0.10	.75	2.55	.12	16.66	<.001	0.46	.50	6.66	.02	1.83	.19
Stress	3.72	.06	0.16	.70	8.54	.01	1.02	.32	6.08	.02	4.04	.06
DASS total	2.16	.15	1.42	.24	5.81	.02	1.46	.23	4.03	.06	4.14	.05
LASSI												
Anxiety	0.62	.43	0.02	.97	63.91	<.001	1.09	.30	27.42	<.001	5.28	.03
Attitude	5.43	.03	0.89	.35	19.10	<.001	0.01	.91	4.04	.06	0.00	.96
Concentration	0.74	.40	0.40	.53	42.71	<.001	1.53	.22	17.84	<.001	5.18	.03
Information processing	0.04	.83	0.08	.78	55.29	<.001	6.17	.02	17.79	<.001	8.83	.01
Motivation	0.00	.97	0.05	.83	42.84	<.001	4.94	.03	17.41	<.001	3.08	.09
Self-testing	2.04	.16	3.61	.06	59.77	<.001	0.08	.77	28.64	<.001	0.09	.76
Selecting main ideas	0.32	.57	0.08	.78	74.17	<.001	2.99	.09	39.44	<.001	9.07	.01
Study aids	0.20	.66	5.58	.02	47.71	<.001	7.90	.01	17.86	<.001	7.99	.01
Test strategies	0.29	.59	0.02	.90	46.12	<.001	17.23	<.001	26.12	<.001	16.69	<.001
Time management[a]	0.16	.69	0.73	.40	30.91	<.001	7.50	.01	18.37	<.001	5.37	.03

Note. *TMS* Toronto Mindfulness Scale (scale range 13-65), *BDEFS-LF* Barkley Deficit in Executive Functioning Scale-Long From (scale range 89-356, subscale range varies), *ASRS* ADHD Self-Report Scale (scale range 18-90), *MWT* and *MWT2* Mind Wandering Task (scale range 0-7), *DASS* Depression Anxiety and Stress Scale (scale range 0-126, subscale range 0-42), *LASSI* The Learning and Study Strategies Inventory (scale range 80-400, subscale range 8-40). Unless otherwise specified in the intent-to-treat sample the degrees of freedom for homogeneity of regression slope is $F(1, 36)$, for homogeneity of variance is $F(1, 38)$ and for the ANCOVA is $F(1, 37)$. In the completer sample the degrees of freedom for ANCOVA is $F(1, 22)$; [a] Due to missing data (n =1) in these subscales, the intent-to-treat sample the degrees of freedom for homogeneity of regression slope is $F(1, 35)$, for homogeneity of variance is $F(1, 37)$ and for the ANCOVA is $F(1, 36)$.; [b] Baseline depressions scores were log transferred in order to remove the significant skew, which was larger than the recommended $Z = 2.58$ at $p < .05$.

Table 12

Means (SD) and Within- and Between-Group Effect Sizes (95% CI) for the MAS Program and WL Conditions Following Treatment for the Intent-To-Treat Sample

	MAS program (*n* = 20)		WL (*n* = 20)		Within-group effect size (*d*) Pre-Post		Between-group effect size (95% CI)
Measure	Pre	Post	Pre	Post	MAS	WL	Post-Post
TMS							
Curiosity	18.55 ± 3.55	19.65 ± 5.09	20.00 ± 4.04	19.20 ± 5.38	-0.25	0.16	0.09 [-0.53, 0.71]
De-centering	19.60 ± 5.69	17.45 ± 5.51	19.75 ± 6.32	18.85 ± 5.83	0.38	0.15	-0.25 [-0.86, 0.37]
TMS total	38.15 ± 7.73	37.10 ± 9.52	39.75 ± 8.32	38.05 ± 9.64	0.12	0.19	-0.10 [-0.72, 0.52]
BDEFS-LF							
Self-management	60.75 ± 11.38	55.65 ± 11.65	60.35 ± 12.77	63.25 ± 13.41	0.44	-0.22	-0.60 [-1.24, 0.03]
Self-organization	55.68 ± 11.30	50.79 ± 13.36	58.00 ± 14.82	61.35 ± 14.13	0.38	-0.24	-0.77 [-1.42, -0.12]
Self-restraint	43.58 ± 10.74	41.05 ± 10.89	38.80 ± 13.09	40.05 ± 13.97	0.23	-0.09	0.08 [-0.55, 0.71]
Self-motivation	27.45 ± 9.32	25.10 ± 8.58	29.30 ± 9.01	31.45 ± 7.99	0.26	-0.25	-0.77 [-1.41, 0.12]
Self-regulation of emotions	30.50 ± 6.92	26.70 ± 5.73	29.95 ± 10.20	30.40 ± 8.00	0.59	-0.05	-0.53 [-1.16, 0.10]
EF deficits	40.75 ± 16.66	32.85 ± 18.11	40.20 ± 19.45	44.45 ± 20.37	0.45	-0.21	-0.60 [-1.23, 0.03]
BDEFS ADHD	23.00 ± 4.63	21.58 ± 5.01	22.10 ± 5.15	23.00 ± 4.87	0.29	-0.18	-0.29 [-0.93, 0.35]
BDEFS total	220.16 ± 37.01	200.89 ±39.23	216.40 ± 47.47	226.50 ± 46.53	0.50	-0.21	-0.59 [-1.24, 0.05]
ASRS (ADHD)							
DSM-IV-TR	3.10 ± 0.79	2.60 ± 1.27	2.65 ± 1.39	2.90 ± 1.48	0.45	-0.17	-0.22 [-0.84, 0.40]
Additional cues	38.90 ± 5.90	36.05 ± 6.82	38.75 ± 7.16	39.75 ± 6.66	0.44	-0.14	-0.55 [-1.18, 0.08]

(Continued on next page)

Table 12 *(Continued)*	MAS program (*n* = 20)		WL (*n* = 20)		Within-group effect size (*d*) Pre-Post		Between-group effect size (95% CI)
Measure	Pre	Post	Pre	Post	MAS	WL	Post-Post
MWT							
Mind wandering	9.25 ± 1.83	8.85 ± 1.81	9.74 ± 1.76	9.32 ± 1.94	0.22	0.23	-0.25 [-0.88, 0.38]
Attention	8.90 ± 1.71	9.00 ± 1.69	10.05 ± 2.25	9.40 ± 1.90	-0.06	0.31	-0.22 [-0.84, 0.40]
DASS							
Depression[a]	13.70 ± 8.89	11.05 ± 7.07	15.05 ± 8.68	15.20 ± 10.32	0.33	-0.01	-0.47 [-1.10, 0.16]
Anxiety	10.50 ± 6.62	10.05 ± 6.71	11.90 ± 9.79	12.25 ± 9.15	0.07	-0.04	-0.27 [-0.90, 0.35]
Stress	19.30 ± 7.95	16.50 ± 6.84	17.85 ± 9.35	18.25 ± 8.88	0.38	-0.44	-0.22 [-0.84, 0.40]
DASS total	43.50 ± 20.82	37.60 ± 16.64	44.80 ± 24.04	45.70 ± 25.04	0.32	-0.04	-0.38 [-1.01, 0.24]
LASSI							
Anxiety	21.50 ± 8.15	23.55 ± 8.66	18.70 ± 6.88	19.60 ± 6.99	-0.24	-0.13	0.50 [-0.13, 1.13]
Attitude	29.40 ± 4.42	30.05 ± 5.51	29.45 ± 5.42	30.25 ± 5.64	-0.13	-0.14	-0.04 [-0.65, 0.58]
Concentration	19.35 ± 6.64	21.50 ± 6.44	18.20 ± 5.22	19.10 ± 5.11	-0.33	-0.17	0.41 [-0.21, 1.04]
Information processing	26.25 ± 5.83	28.15 ± 5.88	26.30 ± 6.06	25.20 ± 5.98	-0.32	0.18	0.49 [-0.13, 1.13]
Motivation	26.35 ± 5.89	27.60 ± 5.42	24.25 ± 6.73	23.25 ± 6.31	-0.22	0.15	0.74 [0.09, 1.38]
Self-testing	20.80 ± 6.83	21.00 ± 4.69	16.10 ± 4.90	17.60 ± 5.24	-0.03	-0.08	0.68 [0.05, 1.32]
Selecting main ideas	26.10 ± 7.64	27.60 ± 6.71	22.60 ± 6.51	22.80 ± 6.38	-0.21	-0.03	0.73 [0.09, 1.37]
Study aids	23.85 ± 6.43	25.70 ± 5.54	21.90 ± 5.85	21.40 ± 4.44	-0.31	0.10	0.89 [0.25, 1.55]
Test strategies	27.20 ± 6.34	29.10 ± 4.62	23.35 ± 5.51	22.50 ± 4.68	-0.34	0.17	1.42 [0.73, 2.11]
Time management	17.85 ± 5.69	19.80 ± 5.01	19.05 ± 5.09	17.40 ± 4.63	-0.36	0.34	0.50 [-0.13, 1.13]

Notes. *TMS* Toronto Mindfulness Scale (scale range 13-65), *BDEFS-LF* Barkley Deficit in Executive Functioning Scale-Long From (scale range 89-356, subscale range varies), *ASRS* ADHD Self-Report Scale (scale range 18-90), *MWT* Mind Wandering Task (scale range 0-7), *DASS* Depression Anxiety and Stress Scale (scale range 0-126, subscale range 0-42), *LASSI* The Learning and Study Strategies Inventory (scale range 80-400, subscale range 8-40). Values are the mean ± standard deviation unless otherwise specified, *d* effect size, CI confidence interval; [a]Baseline depressions scores were log transferred in order to remove the significant skew, which was larger than the recommended $Z = 2.58$ at $p < .05$.

Table 13

Means (SD) and Within- and Between-Group Effect Sizes (95% CI) for the MAS Program and WL Conditions Following Treatment for the Completer Sample

	MAS program (*n* = 9)		WL (*n* = 16)		Within-group effect size (*d*) Pre-Post		Between-group effect size (95% CI)
Measure	Pre	Post	Pre	Post	MAS	WL	Post-Post
TMS							
Curiosity	17.89 ± 3.69	20.89 ± 5.53	19.25 ± 3.00	18.06 ± 4.84	-0.25	0.28	0.56 [-0.27, 1.39]
De-centering	20.11 ± 5.86	17.78 ± 5.33	18.56 ± 6.27	17.50 ± 5.39	0.30	0.18	0.05 [-0.76, 0.87]
TMS total	38.00 ± 8.82	38.67 ± 10.49	37.81 ± 7.57	35.56 ± 8.77	-0.04	0.27	0.33 [-0.49, 1.15]
BDEFS-LF							
Self-management	65.78 ± 10.67	55.22 ± 12.09	61.00 ± 12.64	63.13 ± 13.51	0.92	-0.16	-0.61 [-1.44, 0.23]
Self-organization	54.89 ± 9.24	45.33 ± 10.93	55.50 ± 15.36	60.38 ± 15.35	0.94	-0.32	-1.08 [-1.95, -0.21]
Self-restraint	41.33 ± 11.84	36.22 ± 10.28	38.13 ± 11.94	40.31 ± 13.50	0.46	-0.17	-0.33 [-1.50, 0.49]
Self-motivation	30.89 ± 8.89	25.33 ± 8.54	29.50 ± 9.56	31.44 ± 8.43	0.64	-0.21	-0.72 [-1.56, 0.12]
Self-regulation of emotions	31.78 ± 9.02	23.44 ± 4.72	27.44 ± 9.79	29.06 ± 8.14	1.06	-0.18	-0.79 [-1.63, 0.06]
EF deficits	43.11 ± 14.67	25.11 ± 15.81	38.75 ± 20.71	44.06 ± 22.03	1.18	-0.25	-0.94 [-1.80, 0.09]
BDEFS ADHD	23.22 ± 4.94	20.00 ± 5.31	21.69 ± 4.88	22.81 ± 4.58	0.63	-0.24	-0.58 [-1.41, 0.25]
BDEFS total	224.67±42.67	185.56±40.28	211.56± 49.23	224.31±49.10	0.94	-0.26	-0.84 [-1.69, 0.01]
ASRS (ADHD)							
DSM-IV-TR	3.44 ± 0.73	2.33 ± 1.58	2.94 ± 1.29	3.13 ± 1.36	0.84	-0.14	-0.55 [-1.39, 0.28]
Additional cues	39.44 ± 5.90	34.11 ± 7.06	38.75 ± 7.33	40.25 ± 6.86	0.81	-0.21	-0.88 [-1.74, -0.03]

(Continued on next page)

Table 13 *(Continued)*	MAS program (*n* = 9)		WL (*n* = 16)		Within-group effect size (*d*) Pre-Post		Between-group effect size (95% CI)
Measure	Pre	Post	Pre	Post	MAS (*n* = 9)	WL (*n* = 16)	Post-Post
MWT							
Mind wandering	8.56 ± 1.94	7.56 ± 1.01	9.94 ± 1.77	9.50 ± 2.00	0.65	0.23	-1.13 [-2.00, -0.25]
Attention	7.89 ± 0.93	7.89 ± 0.78	10.38 ± 2.33	9.56 ± 2.03	0.00	0.37	-0.98 [-1.84, -0.12]
DASS							
Depression[a]	14.56 ± 11.85	8.22 ± 6.87	15.25 ± 9.15	16.69 ± 10.96	0.57	-0.14	-0.87 [-1.72, -0.02]
Anxiety	11.44 ± 8.08	9.11 ± 7.08	12.06 ± 9.98	13.50 ± 8.69	0.31	-0.15	-0.54 [-1.37, 0.29]
Stress	20.44 ± 11.39	12.89 ± 7.69	16.06 ± 8.18	17.88 ± 9.46	0.79	-0.20	-0.56 [-1.39, 0.27]
DASS total	46.44 ± 29.42	30.22 ± 18.28	43.38 ± 23.91	48.06 ± 26.16	0.66	-0.19	-0.75 [-1.60, 0.09]
LASSI							
Anxiety	25.11 ± 9.74	29.56 ± 8.25	19.25 ± 7.36	19.88 ± 7.75	-0.48	-0.08	1.22 [0.34, 2.10]
Attitude	29.00 ± 3.67	30.78 ± 6.20	29.88 ± 5.60	31.06 ± 5.71	-0.29	-0.21	-0.05 [-0.86, 0.77]
Concentration	18.78 ± 7.03	23.67 ± 5.59	18.50 ± 5.69	19.44 ± 5.66	-0.73	-0.16	0.75 [-0.09, 1.59]
Information processing	26.11 ± 5.97	30.22 ± 5.49	25.69 ± 5.51	24.81 ± 5.43	-0.71	0.16	0.99 [0.13, 1.85]
Motivation	26.00 ± 6.67	28.22 ± 5.40	24.88 ± 7.14	24.00 ± 6.76	-0.36	0.13	0.67 [-0.17, 1.50]
Self-testing	21.22 ± 9.58	21.56 ± 5.75	16.13 ± 5.12	18.00 ± 5.45	-0.03	-0.35	0.64 [-0.19, 1.48]
Selecting main ideas	26.11 ± 8.54	30.22 ± 5.97	22.94 ± 6.82	22.81 ± 6.88	-0.56	0.02	1.13 [0.25, 2.00]
Study aids	21.56 ± 7.47	26.00 ± 6.20	22.88 ± 5.95	22.13 ± 4.35	-0.65	0.14	0.76 [-0,08, 1.61]
Test strategies	26.56 ± 8.14	30.11 ± 4.83	23.94 ± 5.88	22.56 ± 5.21	-0.46	0.24	1.49 [0.57, 2.40]
Time management	16.11 ± 6.79	20.00 ± 5.52	19.38 ± 5.30	18.06 ± 4.84	-0.63	0.26	0.38 [-0.44, 1.20]

Notes. *TMS* Toronto Mindfulness Scale (scale range 13-65), *BDEFS-LF* Barkley Deficit in Executive Functioning Scale-Long From (scale range 89-356, subscale range varies), *ASRS* ADHD Self-Report Scale (scale range 18-90), *MWT* and *MWT2* Mind Wandering Task (scale range 0-7), *DASS* Depression Anxiety and Stress Scale (scale range 0-126, subscale range 0-42), *LASSI* The Learning and Study Strategies Inventory (scale range 80-400, subscale range 8-40). Values are the mean ± standard deviation unless otherwise specified, *d* effect size, CI confidence interval; [a]Baseline depressions scores were log transferred in order to remove the significant skew, which was larger than the recommended $Z = 2.58$ at $p < .05$.

Relationships between Session Attendance, Homework Compliance, and Program Outcomes

We expected that the number of sessions attended and homework tasks completed in addition to the amount of time spent in formal meditation would correlate with improvements in measures of executive functioning (BDEFS-LF), ADHD (ASRS), mind wandering (MWT), attention (MWT2), negative emotional symptoms (DASS) and academic functioning (LASSI) in our completer sample. Table 14 describes intercorrelations between attendance, homework and meditation completion, and baseline to post-study change scores in outcome variables (BDEFS-LF, ASRS, MWT, MWT2, DASS, and LASSI) for the MAS program completers.

Session attendance correlated negatively with baseline to post-study changes in three BDEFS-LF subscales: Self-management (r = -.75, p < .05), EF deficits (r = -.70, p < .05), and ADHD (r = -.73, p < .05). This indicates that students who attended more sessions experienced less difficulty with regulating themselves to time requirements, less EF deficits, and fewer ADHD-related symptoms. Session attendance was also positively correlated with baseline to post-study changes in the following LASSI subscales; Anxiety (r = .72, p < .05), Motivation (r = .73, p < .05), Study aids (r = .69, p < .05), Selecting main ideas (r = .86, p < .01), and Time management (r = .69, p < .05). These patterns of correlations indicate that students who attended more sessions also showed more improvements in several dimensions of academic functioning.

The amount of homework completed and time dedicated to meditation practice did not correlate with baseline to post-study changes in outcome variables. This suggests that compliance with informal or formal meditation practice was not responsible for the benefits seen in this study.

Table 14

Intercorrelations (Person's) Between Session Attendance, Homework Task Completion, and Amount of Time Spent Meditating and TMS, BDEFS-LF, ASRS, MWT, MWT2, DASS, and LASSI Baseline to Post Measure Change scores in MAP Program Completers

	Session attendance	Homework completion	Meditation time
TMS total	.13	-.01	-.09
Curiosity	.12	-.09	-.18
De-centering	.13	.06	.00
BDEFS-LF total	-.61	-.24	-.01
Self-management	-.75*	-.36	-.16
Self-organization	-.51	-.16	.05
Self-restraint	-.55	-.32	-.09
Self-motivation	-.62	-.28	-.02
Self-regulation of emotions	-.30	-.09	.25
EF deficits	-.70*	-.35	-.16
BDEFS ADHD	-.73*	-.55	-.35
ASRS (ADHD)			
DSM-IV-TR	-.18	-.34	-.43
Additional cues	-.50	-.31	-.12
MWT	-.37	-.11	-.10

(Continued on next page)

Table 14

Intercorrelations (Person's) Between Session Attendance, Homework Task Completion, and Amount of Time Spent Meditating and TMS, BDEFS-LF, ASRS, MWT, MWT2, DASS, and LASSI Baseline to Post Measure Change scores in MAP Program Completers (Continued)

	Session attendance	Homework completion	Meditation time
MWT2	-.64	-.55	-.49
DASS total	-.27	-.20	-.09
Depression	-.19	-.12	-.04
Anxiety	-.20	-.30	-.23
Stress	-.36	-.21	-.06
LASSI			
Anxiety	.72*	.52	.35
Attitude	.39	.03	-.16
Concentration	.54	.52	.41
Information processing	.58	.41	.23
Motivation	.73*	.61	.44
Self-testing	.62	.41	.27
Study aids	.69*	.36	.16
Selecting main ideas	.86**	.65	.47
Test strategies	.55	.36	.19
Time management	.69*	.45	.24

Notes. * $p < .05$, ** $p < .01$

Discussion

The purpose of this research was to establish the feasibility of delivering the MAS program to post-secondary students who experience difficulties with their academic performance. In addition, we hoped to establish the MAS program's preliminary efficacy in improving EF, mind wandering, attention, ADHD, psychological distress, and academic functioning related factors. While our study did not meet two of the three feasibility requirements, the preliminary efficacy results of the MAS program indicated favourable results.

However, low program compliance and not having observed any changes in students' level of mindfulness interferes with the internal validity of this study and makes drawing any causal conclusions about program outcomes difficult.

Feasibility

Feasibility was assessed through recruitment and retention rates, session attendance, and compliance with the between-session homework. The trial was considered feasible if we were successful in randomizing 70% of screened individuals, if at least 70% of students completed at least 4 sessions of the MAS program, and if at least 70% of all homework was completed.

Recruitment and Randomization. We were able to recruit the required number of participants with relative ease (from one university, within 2 month). With the exception of one student, all met eligibility criteria. One student who was eligible declined participation due to illness. Ninety five percent of students were successfully randomized into the two conditions. Other researchers investigating mindfulness-based interventions for university students have also indicated that they had no difficulty with recruitment. In one month, Jain et al. (2007) recruited 104 first and second year students and Lynch et al. (2011) recruited 41 nursing students in two weeks. While recruiting participants for a feasibility study, Kang, Choi, and Ryu (2009) were surprised by the number of nursing students who expressed interest in their intervention. Due to the availability of participants they were able to add a waitlist condition to their study. The interest of participants in our and other studies may reflect the growing popularity of mindfulness among post-secondary students.

However, it is also possible that our success with recruitment reflects the need for programs that help students improve their academic performance. Students' interest in academic improvement rather than in mindfulness is indicated by the recruitment and retention difficulties

of the MBSR programs offered by Health Services at Carleton University (where this study took place; M. Murdock, personal communication, September 6, 2012).

Program completion. It is well known that mindfulness-based interventions are challenged with high attrition rates (30-40% or higher; Baer, 2003; Crane & Williams, 2010; Lynch et al., 2011). To improve attendance the MAS program had fewer sessions (6 weeks) and shorter session duration (1.5 hours) compared to standard MBSR and MBCT programs. Our expectation for better retention rates with the MAS program was supported by the lower (22%) attrition rate found in brief (4 session of 1.5 hours) mindfulness-based program for medical students (Jain et al., 2007). Even lower attrition rates (2-6%) were found in studies where post-secondary students received either monetary compensation ($60; Oman, Shapiro, Thoresen, Plante & Flinders, 2008) or course credits (Kingston, Chadwick, Meron & Skinner, 2007) for participation. Unfortunately, beyond the three $50 cash prizes we raffled to participants who returned for post-study assessment, we were not able to offer any other incentive for program completion.

Despite our program adjustments, the study had an overall dropout rate of 38%, with the MAS program dropout rate reaching 55%. This was significantly higher than the expected 30%, and much higher than the 2-33% attrition rate previously reported by studies using student participants (Jain et al., 2007; Lynch et al, 2011; Kang et al., 2009; Kingston et al., 2007; Oman et al., 2008). Accordingly, we did not meet the 70% MAS program completion feasibility requirement. The reason for the higher attrition rate in our study versus other studies of mindfulness-based programs for university students is not clear. However, variance may be due to differences in student characteristics, the lack of comparable attendance compensation, or differences in program expectations. Furthermore, the differential attrition rate between the MAS

program and WL condition (55% versus 20%) is problematic. Differential attrition rate introduces a bias in estimates of the efficacy of the MAS program, in the internal validity of the study, and interferes with the generalizability of our results.

In the present study, attrition occurred primarily after Session 1 (n = 6), although three students also dropped out after Session 2 and two students did not show up to the first session. The attrition rate after Session 1 is consistent with previous research findings with students (Lynch et al., 2011), as well as with adult populations (Crane & Williams, 2010; Kabat-Zinn & Chapman-Waldrop, 1988). Previous research with students indicates that attrition from mindfulness-based programs is due to personal reasons (Kang et al., 2009), scheduling and family problems, and/or health related complications (Jain et al., 2007). Older adults (M = 33.50) also report schedule conflicts, illness, or dissatisfaction with programs as reasons for dropout (Koszycki, Benge, Shlik, & Bradwejn, 2006). In this study, most students (n = 8) who dropped out of the MAS program were lost to follow up. We were unsuccessful in contacting these participants to obtain an explanation for why they discontinued the program prematurely. The students who did respond (from both conditions, n = 5) to our inquiry cited personal reasons or scheduling problems. Additionally, after the first session three students casually inquired if later sessions of the MAS program would include training in specific academic skills, such as time management or essay writing. This line of inquiry suggests that some students may have dropped out of the MAS program because it did not meet their expectations. This supports the idea that our recruitment was partially successful because students were looking for academic skill support and not because they were hoping to learn about mindfulness. It also suggests that despite clearly communicating with students on three different occasions (recruitment poster,

registration, and intake interview) the details of the MAS program, some students failed to grasp this message.

The high dropout rate in our study—similarly to the success of our recruitment—could also be attributed to the recent 'buzz' about mindfulness. Growing popularity of mindfulness can be credited to the increasing number of media reports about the benefits of mindfulness. Furthermore, community centers are now offering mindfulness-based programs at an accelerated rate, confirming increased interest in mindfulness–based programs in the general population. Half of our participants indicated at registration that they had heard or read about mindfulness, while the other half reported having no prior knowledge. Interestingly, during the intake interview, only three students were able to accurately explain what mindfulness practice may entail. This suggests that whereas the media 'buzz' about mindfulness may have influenced some of our participants, they were not truly familiar with the concepts of mindfulness at the time of registration. Accordingly, we speculate that some students may have signed up for the program out of curiosity and dropped out after determining the program was not in line with their personal interests or expectations.

Another contributing factor to the high dropout rate might be the maturity level of participants in our study. Although there was no statistical difference in participants' age and academic status, completers in the MAS program were advanced standing students, with more than half working on their masters or doctoral thesis. Academic status differences between completers and dropouts suggest that more mature students may have a better ability to decipher recruitment information, be more willing to adhere to the program requirements, and follow through with commitments to improve their academic success. Research with university students has not investigated the relationship between age or academic status and attrition (Jain et al.,

2007; Lynch et al., 2011; Kang et al., 2009), but research with older adults found that participants who drop out tend to be younger than those who complete the program (Crane & Williams, 2010).

Previous research has also identified several mental health related predictors of early termination from mindfulness-based programs. For example, participants' emotional and cognitive reactivity, depressive rumination, brooding (Crane & Williams, 2010; Lynch, 2004), previous depressive episodes (Ma & Teasdale, 2004), and previous suicide attempts (Kuyken et al., 2008) have predicted dropout. On the other hand, a study involving 174 participants found no cognitive or psychological differences between completers and dropouts of an 8-week MBSR program (Carmondy & Baer, 2008), whereas higher levels of stress and sleep disorders predicted better completion rates in Kabat-Zinn and Chapman-Waldrop's (1988) study. In the current study, no statistical difference between completers and dropouts emerged for baseline cognitive and psychological measures, which is consistent with Carmondy and Baer's (2008) results. The variety and discrepancy of mental health predictors of attrition suggest that more research is needed to elucidate subject variables that predict program compliance.

Participants' readiness for change (Prochaska, Diclemente, & Norcross, 1992; Rogers et al., 2001) may have also influenced attrition, but was not assessed in this or other studies (Carmondy & Baer, 2008, Jain et al., 2007; Lynch et al., 2011; Kang et al., 2009). The Transtheoretical Model of Behavior Change identifies five stages of change (*Precontemplation, Contemplation, Preparation, Action* and *Maintenance*), which can indicate a person's readiness to adapt new health behaviours (Prochaska, Diclemente, & Norcross1992). Research indicates that being at the *contemplation* stage may predict dropout (Derisley & Reynolds, 2000). This is not surprising given that people in this stage—although aware of their problems—have not yet

made a commitment to improve their situation (Prochaska et al., 1992). Therefore, it is possible that while participants who dropped out in the current study were aware of their academic problems, they may have not been ready to commit themselves to improve their academic functioning. In hindsight, we believe that assessing participants' readiness for change could have improved our completion rate.

Finally, it is possible that the palatability of the MAS program played a role in attrition. Although adverse effects are uncommon with mindfulness-based interventions, previous research has indicated that some participants report affect flattening, depersonalization, increased self-criticism, and greater awareness of difficulties (Arias, Steinberg, Banga, & Trestman, 2006; Castillo, 1990, Shapiro, 1992). The most common adverse effect associated with mindfulness practices is the experience of depersonalization (feeling disconnected from one's body or environment) which is generally reported by people who engage in rigorous meditation practices (Arias et al., 2006). Because participants in the present study were only introduced to the 15-minute mindfulness practice during Session 2, it is unlikely that they experienced significant negative effects from their meditation practice. Nonetheless, it is possible that the practice of 3MBS, in addition to information learned in the first two MAS sessions, raised some participants' awareness of their academic difficulties and this may have influenced their decision to discontinue the MAS program. Participants may have also found the practice of mindfulness boring or became discouraged with difficulties noticing mind wandering and maintaining their attention focused on the breath.

In summary, our strategies to enhance attendance (program adjustments and three $50 cash prizes) were not sufficient to retain 70% of participants in this study. We believe that more detailed inquiries into the causes of attrition are necessary to improve mindfulness-based

programs retention. High attrition rates can affect the accuracy of results and the internal and external validity of findings. Understanding the causes of attrition not only has implication for program feasibility, but it may also influence program development, recruitment strategies, establishing eligibility criteria, and how intake interviews should be conducted.

Homework compliance. Previous research assessing general homework completion in mindfulness-based programs indicates low compliance rate with homework practice (Baer, 2003, Vettese et al., 2009). Although homework compliance information with post-secondary students is limited, one study reported that during an MBSR program only 12% of students practiced daily meditations and 40% engaged in meditation practices 3-4 times a week (Beddoe, & Murphy, 2004). Furthermore, systematic homework compliance is rarely reported with research findings and reporting means has not been standardized (Baer, 2003, Vettese, et al., 2009, Toneatto & Nguyem, 2007). Studies that do report data on homework completion usually report general compliance rates (some or all homework completed; Beddoe, & Murphy, 2004), anecdotal evidences (Kabat-Zinn et al., 1992; Ramel, Goldin, Carmona, & McQuaid, 2004), or the average amount of time participants spent in formal mindfulness practice (Anderson, Lau, Segal, & Bishop; 2007; Carmody & Baer, 2008; Carlson, Ursuliak, Goodey, Angen, & Speca, 2003).

Homework compliance is pertinent information because mindfulness-based programs demand a considerable time-investment from participants, and therefore the connection between home practice and the benefits of mindfulness meditation must be evaluated. To our knowledge, no research has included information about completion of informal mindfulness practices (negative and positive events calendar, mindful performance of daily task, and eating meals mindfully). Accordingly, we decided to make use of this information in our research. We

itemized homework tasks and reported overall task compliance in addition to providing information about the amount of time students spent in formal meditation.

As mentioned earlier, we reduced the length and amount of homework to better fit students' time schedules and to improve their homework compliance. We also modified the homework curriculum. Although, research indicates that students are most compliant (70%) with mindful yoga practices (Beddoe, & Murphy, 2004), mindful yoga was not incorporated into the MAS program due to the lack of physical resources (room space, yoga mats). This was unfortunate because research indicates that in addition to students' compliance with yoga practice, mindful yoga is strongly associated with increased mindfulness and improved well-being (Carmody & Baer, 2008).

As an alternative, we made the 3-minute breathing space (3MBS)—prior to engagement with academic tasks—the main homework requirement. This decision was supported by previous research indicating the benefits of short meditation practices prior to academic tasks on academic performance (Fiebert & Mead, 1981; Hall, 1999). Furthermore, we believed this practice could be easily incorporated into daily life. Despite the adjustments made to homework requirements of the MAS program, the overall homework compliance of completers was on average much lower (32%) than the expected feasibility requirement of 70%, and no individual student completed 70% of their homework.

Nonetheless, this detailed analysis provided some interesting and meaningful information for mindfulness-based interventions. First, we noticed a declining trend in homework compliance through the five weeks of the reporting period. Whereas students finished more than half of the assigned homework after the first week, less than one-fifth of the homework was completed during the final homework week. Although, it is plausible that time restriction may have played a

role in declining homework compliance, our data suggested otherwise. We hoped that during the five weeks of regular practice the 3MBS would be habit forming and firmly incorporated into students' daily routine. Interestingly, compliance with the 3MBS not only declined during the course of the program, but it seemed to decline faster than compliance with the longer (15-minute) mindfulness practices. Therefore, our participants' homework completion rate suggests that increasing time demands of the semester was not necessarily the cause of declining home practice compliance, and the novelty of the specific meditation practice may have been an influencing factor.

However, it is also conceivable that the 3MBS was introduced too early in the MAS program and this may have contributed to the decline of this practice. The 3MBS was incorporated into the MBCT program to help participants bring the formal practice of mindfulness into their daily life (Segal et al., 2002). In the MBCT program this practice is introduced in Session 3, after participants have practiced the body scan for two weeks and gained a firm understanding of the concepts of mindfulness. In the present study, the 3MBS was introduced in the first session. Without a thorough understanding of mindfulness it is possible that the 3MBS practice was too advanced for students in this study and interfered with their ability to routinize and generalize this practice into their daily life.

We could not identify any studies that provide information about which mindfulness practice is most likely to be incorporated long-term into daily life. Given that in general, participants have difficulty complying with the time commitments of mindfulness-based programs (Baer, 2003, Beddoe, & Murphy, 2004; Carmondy & Baer, 2008, Vettese, et al., 2009), we recommend that future research identify the subtype of meditation practice that is most likely to be incorporated into daily routines.

In a review of the mindfulness literature, Vettese et al. (2009) noted that most studies that assessed home practice made use of paper homework logs, which is generally supplied in MBSR and MBCT programs. To increase our ability to obtain accurate homework information, we developed a web-based homework logging system. We expected that participants would log into the website daily to listen to the pre-recorded guided meditations and to record their homework completion immediately thereafter. Since most post-secondary students spend significant amounts of time on their computer, we assumed this system would facilitate homework recording. Contrary to expectations, students downloaded the meditation practices onto their mobile devices, and after the first homework review session they requested access to paper homework logs. Only one participant completed all homework logs on the web-based system.

This has implication for the accuracy of reported homework in our study. Once students moved to the paper log system, most were no longer logging their homework immediately after completion. Additionally, some students completed their homework logs at the beginning of MAS program sessions, raising concerns that retrospective recall may have biased the accuracy of reported homework. Furthermore, some students failed to bring their paper logs to the session, thus some completed homework was not accounted for in this study. Overall, these findings indicate that mindfulness-based programs are not only challenged by lack of homework completion, but also by the accuracy of reported homework. Although we could not find any published studies that used smartphone applications to track home practice, it is likely that this technology will be used in future research to improve the accuracy of homework reporting.

In an effort to identify potential determinants of program compliance, we investigated the relationship between participants' age, gender, and academic status, and session attendance, and homework completion. We could not identify any relationship between demographic and

academic characteristics of our sample and program compliance, but found that students who attended more sessions also completed more homework and practiced more formal meditation. The relationship between attendance and homework completion suggests that developing strategies to increase the number of sessions students attend might be one way to improve their homework practice compliance.

Finally, it is possible that the adverse effects of meditation practice mentioned earlier (Arias, Steinberg, Banga, & Trestman, 2006; Castillo, 1990, Shapiro, 1992) played a role in our participants' poor homework compliance. Participants may have avoided practicing meditation because it raised their awareness of the difficulties they were experiencing in their academic or personal life, they found the practice boring, or because they experienced difficulties with the meditation practice.

In conclusion, while it appears that there is a demand for programs that support academic performance, mindfulness-based interventions may not suit every student's need. It appears that mindfulness practice requires a level of maturity that may not be present during early post-secondary academic years. While our study did not have enough power to determine significant differences in the age of completers and dropouts, the maturity of completers indicates that the MAS program might be more acceptable for students who are experiencing academic difficulties in the upper years (3rd and 4th year) of undergraduate programs or who are in graduate school.

Although this program did not meet the established feasibility requirements, important information nevertheless emerged. Attrition occurred primarily after the first session, suggesting the need for more thorough program explanations or increased palatability. Homework compliance decreased over time and students were more likely to engage with a new mindfulness task each week, rather than continue with the same practice from week-to-week. This indicates

that introducing a new practice each week, rather than trying to firmly establish one specific practice may also improve homework compliance. Finally, homework compliance was most strongly associated with attendance. Therefore, to increase the feasibility of MAS program most efforts should be directed toward increasing the number of sessions students attend. Session attendance of post-secondary students could be improved with course-credit incentives and better assessment of program applicants' readiness for change.

Preliminary Efficacy of the MAS Program

With this research, we also hoped to obtain preliminary data on the efficacy of the MAS program in improving students' academic functioning. We hypothesised that the MAS program would improve students' EF, reduce their attention deficit related symptoms, enhance their ability to maintain attention on task, lower their psychological distress, and lead to higher academic functioning. Although a number of positive outcomes were observed, results must be viewed with caution considering the caveats described above.

Mindfulness. Initial analyses of the relationship between mindfulness and EF, ADHD, mind wandering, attention, negative emotional symptoms, and academic functioning failed to reveal a relationship with mindfulness with one exception. At the beginning of the study, it appeared that students who experienced more depression were also likely to be more mindful of their experiences. However, this relationship was not apparent at post-study assessment. Furthermore, participants' level of mindfulness did not change from pre- to post-study assessment. The lack of change in participants' mindfulness could be attributed to either the MAS program not inducing mindfulness, or to the inappropriate use of the TMS by the researcher which may have compromised its ability to properly measure mindfulness.

The MAS program incorporates the same mindfulness training elements in similar order as the well-established MBSR (Kabat-Zinn, 1990) and MBCT (Segal et al., 2002) programs. The main difference between MAS and MBSR or MBCT is that rather than focusing on stress or depression, students relate their mindfulness experiences to their academic functioning. An independent MBSR instructor evaluated the audio recordings of the sessions and found that the instructor—who is a trained and experienced MBCT teacher—adhered to the program outline and offered comparable mindfulness instructions as taught in MBSR and MBCT programs. Given the long-standing success of MBSR and MBCT and their demonstrated ability to improve mindfulness (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006; Carmody & Baer 2008; Lau et al., 2006), it is reasonable to believe that the MAS program had the capacity to change participants' level of mindfulness.

Nonetheless, we are not the first to find that mindfulness-based programs do not enhance participants' level of mindfulness. Paterniti, (2007) failed to show changes in mindfulness after three weeks of mindfulness training and attributes the lack of change to the short duration of the program. Following an 8-week MBSR program, Harris's (2010) found partial support for improvement in the *observing* and *describing* subscales of the *Five Facets of Mindfulness Questionnaire* (FFMQ; Baer et al., 2006), but failed to find significant changes in the *acting with awareness, non-judging of internal experiences,* and *non-reactivity to internal experience* subscales. This researcher also suggests that more time might have been required to gain the skills associated with mindfulness. Therefore, it is possible that due to the brevety of our mindfulness-based program and lack of program compliance, the MAS program did not improve participants' level of mindfulness.

However, a more likely explanation for not observing changes on the TMS following the MAS program is that the researcher used the scale inappropriately. In this study, the TMS was administered after the mind wandering task, which required participants to listen to an audio recorded story. During this time, they were prompted seven times to report if their mind had wandered at the time of the probe or if they were focused on the story. No other mindfulness instructions were provided. Since mindfulness can be practiced informally by monitoring awareness on any daily task, we anticipated this task would provide the appropriate experience to evaluate students' capacity for being mindful. In hindsight, we believe that without more formal mindfulness instructions, this task did not evoke the state of mindfulness required to answer questions on the TMS, such as "I experienced myself as separate from my changing thoughts and feelings" or "I was curious about each of the thoughts and feelings that I was having". The low internal consistency of the *curiosity* subscale of TMS in our study could also suggest that students were not able to relate their MWT task experience to the questions of this scale. Considering the low internal consistency of the curiosity subscale of the TMS results should be interpreted cautiously. It is possible that the MAS program did enhance mindfulness but the MWT was not sensitive to detect changes in mindfulness levels as measured by the TMS.

Furthermore, mindfulness is a multidimensional construct and the TMS captures two of its dimensions (*curiosity*, *decentering*). It is possible that another scale such as the FFMQ, which measures five other dimensions (*observing*, *describing, acting with awareness, non-judging of internal experiences*, *non-reactivity to internal experience subscales)* of mindfulness, might have been more sensitive to the effects of our intervention. Nonetheless, according to our results the MAS program did not seem to enhance mindfulness, and changes in mindfulness were not related to improvements in other program outcomes. The lack of significant change in

mindfulness and absence of an association between the TMS with other study outcomes raises questions about the mechanism by which the MAS program improved outcome.

We propose that non-specific factors, such as expectation for improvement, receiving attention or regard from the instructor (Hawthorn effect), and participating in a group (Franke, & Kaul, 1978; Grencavage, Bootzin, & Shoham, 1993; Jensen, Weersing, Hoagwood, & Goldman, 2005) contributed to improvements in study outcomes. In addition, the psychoeducational component of the MAS program may have contributed to positive outcomes. A meta-analysis of brief psychoeducational interventions for psychiatric disorders conducted by Donker, Griffiths, Cuijpers, & Christensen (2009) concluded that psychoeducation reduces symptoms of depression, anxiety, and psychological distress, although, effect sizes associated with these interventions were generally small. In the MAS program, discussions that followed the mindfulness practices during each session were intentionally related to students' academic functioning. The program also entailed psychoeducation about the effects of attribution and explanatory styles, mind wandering, automatic thoughts and irrational beliefs, and avoidance strategies on academic functioning. Accordingly, it is reasonable to believe that the didactic component of the MAS program induced some cognitive or behaviour change in participants. De Shazer (2007)—the founder of *Solution Focused Therapy*—suggested that even a small step toward improving one's situation could ignite a *change process* and lead to larger, systemic improvements in a persons' life within a short period of time.

Correlations amongst outcome measures. We expected to establish a relationship between EF, ADHD, mind wandering, attention, psychological distress, and academic functioning. Most of these relationships were supported in our study. As predicted, students' EF difficulties correlated with the severity of ADHD and psychological distress as well as increased

problems with academic functioning. Furthermore, ADHD symptoms were associated with the severity of students' psychological distress in addition to their problems with academic functioning. However, the relationship between psychological distress and executive and academic functioning was only apparent at post-study assessment.

No relationship between mind wandering and executive functioning, ADHD, and psychological distress was detected. The lack of these relationships is surprising given that the ability to maintain attention plays an important role in EF (Eslinger, 1996; Kaplan & Berman, 2010) and ADHD (Biederman et al., 2004), and is affected by psychological distress (Chajut & Algom, 2003). Nonetheless, *p* values of the completer sample indicated a trend in the expected direction at post-study assessment (EF, $p = .08$, ADHD, $p = .08$), suggesting that in a larger sample size these relationships may be stronger. Furthermore, mind wandering was correlated with academic performance in students who completed the MAS program, indicating that less mind wandering is associated with better academic functioning. Because the MWT was adapted and significantly modified from Smallwood et al., (2007) study, further research is required to validate this task in its new format. More research with the MWT may be able to identify other reasons than small sample size for the lack of relationship between mind wandering and the other outcome measures used in this study.

In conclusion, the correlation analysis supported relationships between EF, ADHD, psychological distress, and academic functioning and with a larger sample size we may have been able to show these relationships with mind wandering. Although, most of these findings support our hypotheses and previously established research findings (Beilock et al., 2002; Kennett & Reed, 2009, Meltzer et al., 2007; Sheilds, 2001; Staal, 2004; Williams, et al., 2009),

we cannot explain why some of these relationships were not present during both baseline and post-study assessments.

Group Comparison. Based on previous research, we proposed that academic performance is critically influenced by the effectiveness of students' EF (Meltzer, et al., 2007) and by their ability to cope with increasing psychological distress in the semester (Andrews & Wilding, 2004; Eisenberg et al., 2009; Weinstein & Palmer, 2002). Because EF is primarily responsible for self-regulation (Barkley 2001) and is believed to be governed by directed attention (Kaplan & Berman, 2010; Wiebe et al., 2008), we suggested that improving students' ability to evoke, focus, and sustain their attention with mindfulness practices would improve their global executive functioning (Flook et al., 2010; Teasdale, 1999, Teasdale et al., 2000; Wells, 2002; Zeidan et al., 2010). Since the practice of mindfulness is also known to improve EF (Flook et al., 2010; Teasdale, 1999; Teasdale et al., 2000; Wells, 2002; Zeidan et al., 2010) and reduce ADHD-related symptoms (Smalley, et al., 2009; Zylowska et al., 2008) and negative emotions (Baer, 2003; Kabat-Zinn, 1990, Teasdale, 1999; Teasdale et al., 2000), we expected the MAS program to replicate these benefits and to improve the academic functioning of our participants.

Executive functioning. EFs play a role in students' ability to manage time (*Self-management to time*), overcome barriers to goal attainment (*Self-organization/problem solving*), restrain their reactions (*Self-restraint/inhibition*), persevere in face of difficulty (*Self-motivation to goal attainment*), regulate emotions (*Self-regulation of emotions*), and control impulsivity and inattention (*EF related ADHD symptoms*; Barkley, 2011, Meltzer, et al., 2007). Because of the above-mentioned relationship between EF and mindfulness (Flook et al., 2010; Teasdale, 1999, Teasdale et al., 2000; Wells, 2002; Zeidan et al., 2010), we expected the MAS program to

improve students' self-reported executive functioning and bring it within the normal range established by BDEFS.

In-line with our expectations and with previous research findings (Flook et al., 2010; Teasdale, 1999; Teasdale et al., 2000; Wells, 2002; Zeidan et al., 2010) participation in the MAS program improved students' global executive functioning in the intent-to-treat sample and meaningful improvements were even more noticeable in students who completed the MAS program. According to the BDEFS manual (Barkley, 2011), completers' executive functioning baseline scores were in the 96th percentile of the normative population in the 18 to 34 age group (males and females). This percentile score indicates that EF difficulties in our completer sample fell within the clinically symptomatic range. After completing the MAS program these students' EF scores were in the normative range (i.e., 87th percentile), supporting meaningful within-group changes in executive functioning. WL participants' baseline scores were in the 96th percentile and neither the intent-to-treat nor the completer sample's scores changed at post-study assessment.

At baseline-assessment, participants' *self-management to time* (98th percentile), *self-organization/problem solving* (93rd percentile), and *self-motivation to goal attainment* (93rd percentile) subscale scores indicated that students' EF in these areas fell into the clinically symptomatic range. The *self-restraint/inhibition* and *self-regulation of emotions* subscale scores were high (91st percentile), while the *EF related ADHD subscale* score was lower (86th percentile). All three would be considered within the normal range. WL participants' subscale scores did not change at post-study.

Participation in the MAS program improved five out of the six individual components of EF in the intent-to-treat sample and was also more pronounced in completers. Students were

better able to manage their time, overcome obstacles to goal attainment, persevere in the face of difficulties, and regulate their emotions following the MAS program. No changes were noted in students' self-restraint, although a trend in the right direction could be observed in the completer sample. Furthermore, post-study assessment scores established that subscale scores for *Self-management to time* and *Self-motivation to goal attainment* reduced below the clinically symptomatic range (91st percentile) in both the intent-to-treat and completer sample, while all other subscale scores were well within the normal range (50-78th percentile) in the completer samples.

To our knowledge no previous research has assessed the relationship between these five EF related factors and mindfulness-based interventions in post-secondary students. However, research indicates that achievement-related self-regulation, such as delaying gratification, is associated with higher levels of mindfulness in post-secondary students (Howell & Buro, 2010; Shao & Skarlicki, 2009). Students' EF related ADHD symptoms as well as EF deficits assessed by individual item severity also reduced in the intent-to-treat sample and was more pronounced in completers. These results support previous research findings on the benefits of mindfulness on EF and ADHD symptoms (Flook et al., 2010; Howell & Buro, 2010; Shao & Skarlicki, 2009; Smalley, et al., 2009; Teasdale, 1999, 2000; Wells, 2002; Zeidan et al., 2010; Zylowska, 2012; Zylowska et al., 2008). However, without observed changes in mindfulness it is likely that changes in participants' executive functioning were due to previously mentioned reasons, such as the Hawthorn effect, psychoeducation, or because of the initiation of change process (De Shazer et al., 2007; Donker et al., 2009; Franke & Kaul, 1978; Grencavage et al., 1993; Jensen et al., 2005).

In summary, our results indicate that the MAS program enhanced students' executive functioning both globally and in five of the six specific areas measured by the BDEFS, suggesting that students' self-regulation to perform academic tasks improved. Although effect sizes in both the intent-to-treat and completer samples indicate changes were meaningful, results should be interpreted with caution given the lack of change in mindfulness and low program compliance. Nonetheless, results are encouraging and further exploration of the relationship between the practice of mindfulness and the executive functioning of academically challenged post-secondary students is warranted.

DSM-IV-TR symptoms of ADHD. Due to previously established relationships between ADHD, EF deficits (Barkley, 2001, 2011), and poor academic functioning (DuPaul et al., 1992; Kerns et al., 1999; Rabiner et al., 2010), and because of the benefits of mindfulness practice on ADHD (Zylowska, 2012; Zylowska et al., 2008), we expected the MAS program would reduce participants' attention deficit related symptoms. The reduction in *DSM-IV-TR highly consistent symptoms with ADHD* was meaningful for students who completed the MAS program, but not in the intent-to-treat sample. These ADHD symptoms were established to be well below the critical range following the intervention. The *additional cues of ADHD* decreased in the intent-to-treat sample and were more pronounced in completers. The reductions of ADHD symptoms were meaningful in the completer sample. Therefore, our results support previous research findings (Zylowska, 2012; Zylowska et al., 2008), and suggests that following the MAS program students were less distracted, more organized, and better equipped to focus on their academic tasks. Given the similarity between ADHD and directed attention fatigue (Kaplan, 1995; Kaplan & Berman, 2010; Masicampo & Baumeister, 2008, Wells, 2002) and that ADHD scales are used to measure DAF, our results could also imply that the MAS program facilitated DAF recovery in students.

However, as mentioned previously, the methodological issues of this study interferes with our ability to attribute ADHD symptom reduction in our sample to the practice of mindfulness.

Mind wandering. Smallwood (2007) suggests that from the academic perspective mind wandering interferes with the encoding of incoming information and results in inappropriately synthesized understanding. Mind wandering is often the result of low attention control and requires metacognitive awareness for recovery (Smallwood et al., 2007; Wells, 2008). It also plays an important role in protecting brain resources against directed attention fatigue (DAF, Kaplan & Berman, 2010), which reduces our ability to fight off distractions and impairs mental competence (Kaplan & Berman, 2010). Given that the practice of mindfulness is known to increase metacognition (Flook et al., 2010; Teasdale, 1999; Wells, 2008) and diminish DAF (Kaplan, 2001) we expected the MAS program to reduce lapses in students' attention.

Mind wandering reduced in MAS program completers but not in the intent-to-treat sample. Reductions in mind wandering were meaningful in the completer sample and suggest that at the end of the program students were better equipped to sustain their attention on task and synthesize more academic information. Mind wandering improvements could also be attributed to potential DAF recovery in completers, but further research is required to substantiate this hypothesis. However, the lack of improvement in accurately recalling the information presented at the time-caught-probes contradicts these results and suggests that students were not any better in paying attention to presented information than at the time of the baseline-assessment. The lack of improvement in attention suggests that students may have under reported their mind wandering after the intervention. It is conceivable that under reported mind wandering was influenced by task familiarity at post-study assessment.

Psychological distress. Based on previously established connections between EF, psychological distress, academic functioning (Kennett & Reed, 2009, Meltzer et al., 2007; Sheilds, 2001; Williams et al., 2009) and mindfulness (Baer, 2003; Flook et al., 2010; Kabat-Zinn, 1990, Teasdale, 1999; Teasdale et al., 2000), we proposed that participation in the MAS program could result in the reduction of students' psychological distress. This hypothesis was only supported in the completer sample of our study and was not apparent in the intent-to-treat sample. Completer students' psychological distress reduction reached meaningful levels following completion of the MAS program.

Prior to the intervention depression, anxiety and stress reached on average moderate level of severity. Following the completion of the MAS program students' depression and stress reduced to normal levels, while anxiety remained at moderate levels. The meaningful depression and stress reduction found in our completer sample support previous research findings with mindfulness-based interventions (Baer, 2003, Kabat-Zinn et al., 1992; Teasdale, 1999; Teasdale et al., 2000). The level of psychological distress found in our sample highlights the importance of offering stress management interventions in post-secondary educations. Although, most schools provide counselling at health service departments, we recommend that retention programs recognize teaching coping strategies for psychological distress to be as important as teaching specific EF and academic related skills.

Academic functioning. The premise of our study indicated that poor academic performance is associated with students' EF deficits (Meltzer et al., 2007) and their poor ability to cope with psychological distress (Kennett & Reed, 2009, Sheilds, 2001). Our baseline scores of EF, psychological distress, and academic functions supported these hypotheses. Furthermore, research also indicated that academic functioning (e.g., attitude, motivation, study skills) rather

than academic performance (GPA and SAT scores) might provide a more well-rounded assessments for preventing dropout (Felder, Forrest, Baker-Ward, Dietz, & Mohr, 1993; Thompson, 2011).

The LASSI suggests that subscale scores between 50 to 75 (optimal range) are needed to avoid serious problems in succeeding in post-secondary education. Baseline-assessment subscale scores (between 18 to 29) indicated that students in our sample were well below the range where academic success can be expected in all ten areas (*anxiety, attitude, concentration, information processing, motivation, selecting main idea, self-testing, study aids, test strategies,* and *time management*) of academic functioning. These results were in line with their self-reported poor grades and supported their concerns about their future academic success.

To our knowledge no research has investigated the benefits of mindfulness-based interventions on the 10 academic functions investigated by the LASSI in post-secondary students. However, we expected that the MAS program would improve students' academic functioning based on its inferred benefits from relevant research (Beauchemin et al., 2006, Bostanov et al., 2012; Fiebert & Mead, 1981; Hall, 1999; Jha et al., 2010; Kember, 1985). Specifically, we anticipated improvements because the practice of mindfulness has been found to enhance the ability to evoke, focus, and maintain attention (Bishop et al., 2004), and improve information processing (Breslin et al., 2002; Wells, 2002). Furthermore, students' level of mindfulness has been shown to predict achievement related self-regulation (Howell & Buro, 2010; Shao & Skarlicki, 2009). Since, the MAS program did not involve specific training in academic success related skills, such as preparing study aids or learning test strategies, we did not expect that academic functioning as it relates to exam preparation would reach the optimal range.

Academic anxiety. Academic anxiety reflects the tension, concerns, and fears students feel about studying and their academic progress. Increased anxiety can interfere with students' ability to pay full attention to academic tasks and may increase their academic achievement related self-criticism (Weinstein & Palmer, 2002). Students in our study were experiencing severe academic anxiety, supporting previous research findings that poor academic performers have difficulty coping with psychological distress (Andrews & Wilding, 2004; Eisenberg et al., 2009; Kennett & Reed, 2009; Sheilds, 2001; Weinstein & Palmer, 2002). Decreases in academic anxiety were not apparent in the intent-to-treat sample, and although completer results showed significant and meaningful changes, within group effect size did not reach meaningful levels.

Change in academic anxiety paralleled the results found by the DASS and confirms that anxiety, whether generalized or specific to academic performance, did not reduce to a level where it would not interfere with students' academic functioning. Previous research review has supported the positive effects of mindfulness on anxiety (Baer, 2003) even in academic settings (Beauchemin et al., 2006). However, in Toneatto and Nguyen (2007) research review—which included 15 studies—only eight studies reported reduced anxiety following participation in mindfulness-based programs, whereas the other seven studies found no evidence for this relationship. Toneatto and Nguyen (2007) suggest that mindfulness-based program benefits may be due to non-specific factors and recommend the use of active control conditions to eliminate ambiguity in future results. Although discrepancies in previous research findings may explain why anxiety did not decrease response in this study, students' lack of compliance with the meditation home practice may have interfered with the MAS program's ability to reduce anxiety.

Attitude. Academic functioning is influenced by students' general attitude toward school and their motivation to successfully complete their programs. Poor attitude about post-secondary

education may indicate students' lack of belief in the relevance and importance of their education, which in-turn may, influence their motivation to successfully complete their program (Weinstein & Palmer, 2002). Students in our study had very poor attitude toward their education and their attitude did not improve following the MAS program. This suggests that the MAS program had no influence on this academic functioning related construct and our poor results (intent-to-treat sample, $p = .91$; completer sample $p = .96$) may indicate that the practice of mindfulness may not play a role in improving attitudes. To our knowledge no other research has looked at the relationship between academic attitudes (academic or otherwise) and the practice of mindfulness. Therefore, it is difficult to draw any conclusion about the lack of this relationship in our sample. Weinstein and Palmer (2002) suggest that academic attitudes could be improved by helping students better understand the connection between their academic functioning and future life outcome. Because of the influence of students' attitude on their academic outcomes we recommend that future research investigate how post-secondary retention programs could deepen this connection.

Concentration. The ability to concentrate on academic activities—rather than on distractive events, thoughts, or emotions—is imperative for academic success (Weinstein & Palmer, 2002). Poor concentration interferes with students' ability to direct and maintain their attention on academic task and results in missing information. Students in our sample had very poor ability to concentrate at the beginning of this study. Improvements in concentration were only supported in the completers and were not apparent in the intent-to-treat sample. Changes in concentration were meaningful in our completer sample, which supports previous research findings (Bostanov et al., 2012). Nevertheless, the lack of improvement in recalling information after the MWT contradicts the development of enhanced attention, and suggests the possibility

that participants may have over reported changes in their level of concentration. In addition, students' level of concentration following the completion of the MAS program indicated that more diligent mindfulness practice is required if students expect to improve their academic functioning through the practice of mindfulness.

Information processing. The ability to process new information requires students to draw on previous knowledge and experiences, beliefs, and attitudes for reasoning (Weinstein & Palmer, 2002). In-line with previous research (Bishop et al., 2004; Breslin et al., 2002; Wells, 2002), and as we expected, students' ability to elaborate, organize, understand, and recall academic information improved in the intent-to-treat sample and were more pronounced in completers. Furthermore, improvements in information processing were meaningful in the completer sample; however, students' ability to process information did not reach levels where academic success can be expected. Although the results of information processing are encouraging, the caveats of this study reduce confidence in this outcome.

Motivation. Academic success requires students to be motivated to attend class and comply with course requirements to the best of their ability and in a timely manner (Weinstein & Palmer, 2002). We could not identify a study that investigated the benefits of mindfulness-based interventions on students' motivation. However, one study indicated that people who have higher levels of mindfulness also engage in more autonomously motivated behaviour (Levesque & Brown, 2007). Therefore, it was reasonable to believe that the MAS program would improve students' motivation to successfully complete their academic requirements. As expected, students' motivation improved after participating in the MAS program in the intent-to-treat sample. However, results were not more pronounced in the completer sample and within-group changes did not support the meaningfulness of motivation changes. Although the changes in

motivation in our study are promising, lack of previous research on the effect of mindfulness-based interventions on motivation, in addition to the methodological issues with our study, suggest that further investigation is required into the benefit of mindfulness on motivation.

Exam preparation (Self-testing, Selecting main ideas, Study aids, and Test strategies). Academic achievement is dependent on students' ability to properly prepare for examination. It is critical that students are able to identify the information they need to study, engage in self-testing, and make use of study aids and test strategies to improve their ability to retain and recall information (Weinstein & Palmer, 2002). Not surprisingly, based on our baseline-assessment, students in our sample did not use exam preparation strategies successfully.

Participation in the MAS program did not improve students self-testing. Selecting main ideas only improved meaningfully in participants who completed the MAS program but showed no change in the intent-to-treat sample. The use of study aids improved after participation in the MAS program and was more pronounced and meaningful in completers. Although the use of test strategies also improved in both the intent-to-treat and completer sample these changes were not meaningful. Furthermore, improvements in exam preparatory skills failed to reach the optimal range where academic success could be expected. However, only two students who completed the MAS program were involved in end-of-term examination at the time of post-study assessment, as opposed to most of the students in the WL condition. Therefore, our results may not reflect accurate potential changes in exam preparation following the MAS program, because most of the completers did not need to draw on these skills prior to post-study assessment.

Time management. The ability to create and effectively use time schedules allow students to appropriately manage their time between important tasks, competing goals, distractions, and procrastinations. To set realistic time expectations, students need to know their own academic

strengths and weaknesses, best cognitive functioning times, and how they cope with difficult situations (Weinstein & Palmer, 2002). Although our participants' ability to make and use schedules improved in the intent-to-treat sample, only the completer sample's within-group changes indicated the meaningfulness of time-management changes. Furthermore, according to LASSI score interpretation, mean scores in our sample indicated that time management remained the lowest academic function. The baseline and post-study assessment scores of the *Self-management to time* subscale of the BDEFS also supported poor time-management skills in our sample.

In conclusion, as we expected, students in our sample reported very poor academic functioning at baseline-assessment. Information processing, motivation, use of study aids and test strategies, and time management improved in the intent-to-treat sample. Anxiety, concentration, and selecting main ideas only improved in students who completed the MAS program, whereas attitudes and self-testing showed no significant changes. Changes were meaningful for concentration, information processing, selecting main ideas, study aids, and in time management in the completer sample and not meaningful for anxiety, motivation, self-testing, and test strategies. Furthermore, despite improvements, none of the 10 academic functioning constructs reached the optimal range where academic success can be expected.

As mentioned previously, the lack of internal validity and low program compliance in this study make it difficult to make causal conclusions. Although it is possible that a larger sample size might have improved our results, we believe that more diligent session attendance and mindfulness practice are essential to further improve students' academic functioning. We also recommend combining mindfulness training with teaching specific academic achievement related skills and strategies to improve students' chances of academic success. To gain more

specific information about the effect of mindfulness on exam preparatory skills and strategies, future research needs to ensure that program participants engage in end-of-term examination. Finally, given the lack of research on the benefits of mindfulness on academic functioning in post-secondary students we reiterate the importance of further investigation. However, for the MAS program to be successful in improving academic functioning students' program compliance needs to improve.

Relationships between Session Attendance, Homework Compliance, and Program Outcomes

Vettese et al. (2009) not only reviewed homework compliance reports in 98 studies, but also examined if these studies evaluated connections between homework practice and program benefits. Out of the 98 studies only 23 investigated the relationship between homework practice and program outcomes. Half (n=13) of these studies reported partial support, while the other half (n=11) found no connection between home practice of mindfulness and study outcomes. Due to the ambiguity of these results, and because most of these studies did not correlate program outcomes with all homework completed (including informal practice) or with the number of sessions attended, we decided to investigate these relationships with program outcomes.

We expected that the number of sessions attended, the number of homework tasks completed, and the amount of time students spent in formal meditation would correlate with improvements in executive functioning, ADHD, mind wandering, attention, psychological distress, and academic functioning. Based on our results it appears that only session attendance correlated with improvements. The number of homework tasks completed, which included both formal and informal mindfulness practices and the amount of time spent in formal meditation did not predict any of our study outcomes.

Specifically, session attendance correlated with improvements in EF related self-management to time and with the following academic functions: concentration, motivation, selecting main ideas, the use of study aids, and time management. Session attendance also correlated with reductions in EF deficits, ADHD-related symptoms, and academic anxiety.

The lack of relationship between homework completion and program outcomes is surprising given that in the feasibility results there were strong correlations between attendance and homework completion. However, our results are consistent with some of the studies reported in Vettese et al.'s (2009) review. The lack of relationship between mindfulness practice and program outcomes, in addition to finding no change in students' level of mindfulness after the MAS program, indicates that mindfulness was probably not responsible for improved outcome in this study.

In summary, our results suggest that session attendance was the only correlate of MAS program outcomes. Without previous research investigating the relationships between session attendance, completed homework tasks, time spent meditating, and changes in executive and academic functioning, it is difficult to interpret these relationships. Given the low compliance rate with home practice in mindfulness-based programs (Vettese et al., 2009), we recommend that future research focus on improving session attendance and reconsider the importance of homework tasks.

Study Limitations

There are several limitations in the present research that should be considered when interpreting the above results. First, the high dropout rate, poor homework compliance and concerns with the accuracy of homework reporting are the most important limitation of this study and reduce confidence in efficacy results. Furthermore, this was a feasibility study and efficacy

results are preliminary and should be interpreted with caution. The lack of program compliance suggests that factors other than mindfulness may explain the improvements observed in this study. To confirm the role mindfulness played in the positive changes in EF, ADHD, psychological distress, and academic functioning, future research needs to investigate how attendance, homework compliance, especially formal practice of mindfulness, and homework reporting could be improved.

A second limitation of the study is that our manipulation check did not confirm that mindfulness improved in our sample. Although this may have been due to the mind wandering task not evoking the level of mindfulness required by TMS to measure mindfulness, the lack of relationship between the amount of time spent in formal meditation and program outcomes support the idea that mindfulness did not contribute to improvements found in this study. Without confirmed changes in participants' level of mindfulness, program outcomes cannot be attributed to the practice of mindfulness.

Nonetheless, due to limitations associated with using the TMS within the context of the MWT, improvement in participants' level of mindfulness remains a possibility. Accordingly, it might be worthwhile to assess changes in mindfulness by having participants complete the TMS after the first and last mindfulness practice in the MAS program, or by using a different scale that does not require a mindfulness practice immediately before assessment. Furthermore, given the self-regulation and attention difficulties reported by participants at baseline, it is not surprising that participants experienced difficulty sustaining their individual meditation practice. To remedy this situation future research should investigate the effects of an extended meditation practice during MAS sessions and evaluate different strategies that could improve homework compliance.

Some examples include encouraging participants to meet informally to practice mindfulness together between sessions or participate in community-based yoga and meditation programs.

A third limitation of the study is that we used a waitlist control rather than an active control condition. We used a waitlist control because it is practical and controls for spontaneous improvements. However, a waitlist condition does not control for powerful non-specific factors that contribute substantially to outcomes. Non-specific factors as mentioned previously, may include expectation for improvement, receiving attention or regard from the instructor, and participating in a group (Franke & Kaul, 1978; Grencavage et al., 1993; Jensen et al., 2005). Any of these non-specific factors may have contributed to improvements found in our study and could explain why session attendance rather than time spent in meditation correlated most with our program outcomes. To control for the effects of non-specific factors on program outcomes it has been recommended to use a comparable control condition (Bishop, 2002; Schwartz, Chesney, Irvine, & Keefe, 1997). Therefore, we recommend that future research use a more active control condition such as a 6-week relaxation intervention.

Finally, the study relied solely on self-report measures and did not include a measure of social desirability. Self-report measures are known to be subject to response bias and are influenced by the desirability to avoid embarrassment or project a favourable image. They are also affected by the emotional state of participants at the time of filling out the questionnaires (Allport, 1927; Dunning, Heath, & Suls, 2005; Fisher & Katz, 2000; Zerbe & Paulhus, 1987). Because response bias may alter scores on self-report questionnaires, future research should include more objective measures of executive and academic functions to assess changes following the MAS program. *The Tower of London Task* (Shallice, 1982) may be such an objective measure as it investigates a complex set of cognitive processes, including planning,

computations, working memory, mental flexibility, attention allocation, and response inhibition. As an alternative, changes in grades could also indicate improvement in academic functioning following the MAS program, although grades are affected by several factors and would require multiple semesters for observations.

Future Research

As a final recommendation we propose that future research investigate the benefits of the MAS program in graduate student retention. According to the Canadian Association for Graduate Studies (CAGS, 2012) over 190,000 students are currently enrolled in graduate programs, however, statistics indicate that less than 50 percent will graduate (Elgar, 2003). In addition to high attrition rates, time-to-degree completion has increased over the years (from 36 up to 82 month; Statistic Canada, 2008). Accordingly, PhD program attrition and prolonged time-to-degree completion is also a significant problem in most Canadian universities.

Although we recognize that the reasons why graduate students may fail to complete their degree or complete it in a timely manner is potentially different from why undergraduate students experience academic difficulties, our data indicate that they also suffer from EF deficits, ADHD-symptoms, psychological distress, and problems with academic functioning. Given that maturity may have played a role in retaining participants in the MAS program, we believe this intervention may potentially be more feasible with and beneficial for graduate students, and could possibly improve their academic success.

Finally, despite issues with internal validity of the study, we recommend that future research investigate the potential of combining the MAS program with existing retention program curriculum. It is possible that improving self-regulation and attention and reducing

psychological distress with mindfulness, in combination with learning strategies may be more beneficial than a unitary approach to improve retention.

Implications

Nearly 20 percent of students drop out of undergraduate post-secondary education each year (Shaienks et al., 2005; Wintre et al., 2006), translating to the loss of 2,000 students from any institution with a population of 10,000 first- and second-year students. Consequently, these students lose out on the health, social, and financial benefits associated with post-secondary education. Therefore, minimizing these negative outcomes of attrition is important for students, post-secondary institutions, and governments. Additionally, universities have a significant financial incentive to keep students enrolled in their programs. In Ontario, universities generate approximately $14,000 annual income per student from tuition fees and provincial funding (Statistics Canada, 2009; Ontario Ministry of Finance, 2010; Thompson, 2010). Based on these numbers, attrition results in nearly $28,000,000 loss of annual income. While most post-secondary retention programs focus on improving specific academic success related skills, such as time management, note taking, or essay writing (Campbell & Campbell, 2007; Engle et al., 2003; Scott & Homant, 2007), they are only successful in retaining on average 30% of students who participate in these programs (Thompson, 2010).

Although based on our results the MAS program did not meet feasibility requirements, and due to methodological issues with this study, positive program outcomes cannot be attributed to the practice of mindfulness. Nevertheless, we suggest that our results are encouraging and that the MAS program warrants further investigation. Overall, our preliminary efficacy indicates that with methodological improvements, the MAS program may have the potential to improve executive and academic functioning and to reduce psychological distress in students with

academic concerns. The MAS program costs approximately $100 (instructor fee and participants manual) per student, representing 0.07% of the income universities generate annually per student. This cost is minimal and might be a worthwhile investment even if retention rates are low. Given the significant implications of academic attrition and the low success rate of other academic retention programs, we believe that despite the methodological problems with our study the practice of mindfulness may still hold some important benefits for post-secondary retention efforts.

References

Allport, F. H. (1927). Self-evaluation: a problem in personal development. *Mental Hygiene, 11,* 570–583.

Altschuler, A., Rosenbaum, E., Gordon, P., Canales, S., & Avins, A. L. (2012). Audio recordings of mindfulness-based stress reduction training to improve cancer patients' mood and quality of life--a pilot feasibility study. *Supportive Care in Cancer, 20*(6), 1291–1297. doi:http://dx.doi.org/10.1007/s00520-011-1216-7

Anderson, N. D., Lau, M. A., Segal, Z. V., & Bishop, S. R. (2007). Mindfulness-based stress reduction and attentional control. *Clinical Psychology and Psychotherapy, 14* (6), 449–463. doi:10.1002/cpp.544

Andrews, B., & Wilding, J. M. (2004). The relation of depression and anxiety to life-stress and achievement in students. *British Journal of Psychology, 95*(4)*,* 509–521. doi:10.1348/0007126042369802

Arain, M., Campbell, M. J., Cooper, C. L., & Lancaster, G. A. (2010). What is a pilot or feasibility study? A review of current practice and editorial policy. *BMC Medical Research Methodology, 10*(67). doi:10.1186/1471-2288-10-67

Araque, F., Roldán, C., & Salguero, A. (2009). Factors influencing university drop out rates. *Computers & Education*, *53*(3), 563–574. doi:10.1016/j.compedu.2009.03.013

Arias, A. J., Steinberg, K., Banga, A., & Trestman, R. L. (2006). Systematic review of the efficacy of meditation techniques as treatments for medical illness. *Journal of Alternative and Complementary Medicine (New York, N.Y.), 12*(8), 817–832 doi:10.1089/acm.2006.12.817.

Arnsten, A. F. T. (2009). Stress signalling pathways that impair prefrontal cortex structure and

function. *Nature Reviews: Neuroscience, 10*(6), 410–422. doi:10.1038/nrn2648Focuson: Stress

Baer, R. A. (2003). Mindfulness training as a clinical intervention: A conceptual and empirical review. *Clinical Psychology: Science and Practice, 10*(2), 125–143. doi:10.1093/clipsy/bpg015

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment, 13*(1)*,* 27–45. doi: 10.1177/1073191105283504

Barkley, R. A. (2001). The executive functions and self-regulation: An evolutionary neuropsychological perspective. *Neuropsychology Review, 11*(1), 1–29. doi:10.1023/A:1009085417776

Barkley, R. A. (2011). *Barkley deficits in executive functioning scale (BDEFS)*. New York: The Guilford Press

Barkley, R. A., & Murphy, K. R. (2011). The nature of executive function (EF) deficits in daily life activities in adults with ADHD and their relationship to performance on EF tests. *Journal of Psychopathology and Behavioral Assessment, 33*(2), 137–158. doi:10.1007/s10862-011-9217-x

Baumeister, R. F., Bratslavsky, E., Muraven, M. & Tice, D. M. (1998). Ego-depletion: is the active self a limited resource? *Journal of Personality Social Psychology, 74*(5)*,* 1252–1265. Retrieved from http://my.psychologytoday.com/files/attachments/584/baumeisteretal1998.pdf

Baumeister, R. F., Gailliot, M., DeWall, C. N., & Oaten, M. (2006). Self-regulation and personality: How interventions increase regulatory success, and how depletion moderates

the effects of traits on behavior. *Journal of Personality, 74*(6), 1773–1801. doi:10.1111/j.1467-6494.2006.00428.x

Beauchemin, J., Hutchins, T., & Patterson, E. (2008). Mindfulness meditation may lessen anxiety, promote social skills, and improve academic performance among adolescents with learning disabilities. *Complementary Health Practice Review, 13*(1), 34–45. doi: 10.117/1533210107311624

Beddoe, A. E. & Murphy, S. O. (2004). Does mindfulness decrease stress and foster empathy among nursing students? *Journal of Nursing Education, 43*(7), 305–312. Biederman, J., Monuteaux, M. C., Doyle, A. E., Seidman, L. J., Wilens, T. E., Ferrero, F., . . . Faraone, S. V. (2004). Impact of executive function deficits and attention-Deficit/Hyperactivity disorder (ADHD) on academic outcomes in children. *Journal of Consulting and Clinical Psychology, 72*(5), 757–766. Retrieved from http://search.proquest.com/docview/62125369?accountid=14701

Beilock, S. L., Carr, T. H., MacMahon, C., & Starkes, J. L. (2002). When paying attention becomes counterproductive: Impact of divided versus skill-focused attention on novice and experienced performance of sensorimotor skills. *Journal of Experimental Psychology: Applied, 8*(1), 6–16. doi:10.1037/1076-898X.8.1.6

Best, J. R., Miller, P. H., & Naglieri, J. A. (2011). Relations between executive function and academic achievement from ages 5 to 17 in a large, representative national sample. Learning and Individual Differences, 21(4), 327–336. doi:10.1016/j.lindif.2011.01.007

Bhikkhu, T. (2009). *One tool among many: The place of vipassana in buddhist practice*, Access to Insight, Retrieved from http://www.accesstoinsight.org/lib/authors/thanissaro/onetool.html

Biederman, J., Monuteaux, M. C., Doyle, A. E., Seidman, L. J., Wilens, T. E., Ferrero, F., . . . Faraone, S. V. (2004). Impact of executive function deficits and attention-deficit/hyperactivity disorder (ADHD) on academic outcomes in children. *Journal of Consulting and Clinical Psychology, 72*(5), 757–766. doi:10.1037/0022-006X.72.5.757

Bishop, S. R. (2002). What do we really know about mindfulness-based stress reduction? *Psychosomatic Medicine, 64* (1), 71–83. doi:0033-3174/02/6401-0071

Bishop, S. R., Lau, M., Shapiro, S., Carlson, L., Anderson, N. D., Carmody, J., . . . Devins, G. (2004). Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice, 11*(3), 230–241. doi:10.1093/clipsy.bph077

Bishop, S., Lau, M., Segal, Z., Anderson, N., Abbey, S., Devins, G., . . . Carmody, J. (2006). Development and validation of the Toronto mindfulness scale. *Journal of Clinical Psychology, 62*(12), 1445–1467. doi:10.1002/jclp.20326

Borkowsky, J. G., & Burke, J. E. (1996). Theories, models and measurements of executive functioning: An information processing perspective. In G. R. Lyon, & N. A. Krasnegor (Eds.) *Attention, memory and executive function.* Baltimore: Paul H. Brookes.

Bostanov, V., Keune, M. P., Kotchoubey, B., & Hautzinger, M. (2012). Event-related brain potentials reflect increased concentration ability after mindfulness-based cognitive therapy for depression: A randomized clinical trial. *Psychiatry Research, 199*(3), 174–180. doi:http://dx.doi.org/10.1016/j.psychres.2012.05.031

Brefczynski-Lewis, J., Lutz, A., Schaefer, H. S., Levinson, D. B., & Davidson, R. J. (2007). Neural correlates of attentional expertise in long-term meditation practitioners. *Proceedings of the National Academy of Sciences, USA, 104*(27), 11483–11488. doi:10.1073/pnas.0606552104

Breslin, F. C., Zack, M., & McMain, S. (2002). An information-processing analysis of mindfulness: Implications for relapse prevention in the treatment of substance abuse. *Clinical Psychology: Science and Practice, 9*(3), 275–299. doi:10.1093/clipsy.9.3.275

Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, *84*(4), 822–848. doi:10.1037/0022-3514.84.4.822

Buschkuehl, M., & Jaeggi S. M. (2010). Improving intelligence: a literature review. *Swiss Medical Weekly, 140*(19–20), 266–272. Retrieved from http://www.isdbweb.org/documents/file/4bfd263b26c95.pdf

Campbell, T. A., & Campbell, D. E. (2007). Outcomes of mentoring at-risk college students: Gender and ethnic matching effects. *Mentoring & Tutoring, 15*(2), 135–148. doi:10.1080/13611260601086287

Canadian Association for Graduate Studies. (2012). *Pre-budget submission to the House of Commons Standing Committee on finance regarding the 2012 federal budget.* Presented by Dr. John Doering. Retrieved from http://www.cags.ca/documents/publications/prebudget%20final%20july%2026.pdf

Carlson, L., Speca, M., Patel, K., & Goodey, E. (2003). Mindfulness-based stress reduction in relation to quality of life, mood, symptoms of stress, and immune parameters in breast and prostate cancer out patients. *Psychosomatic Medicine, 65*(4)*,* 571–581. doi:10.1097/01.PSY.0000074003.35911.41

Carmody, J., & Baer, R. A. (2008). Relationships between mindfulness practice and levels of mindfulness, medical and psychological symptoms and well-being in a mindfulness-based stress reduction program. *Journal of Behavioral Medicine, 31*(1), 23–33. doi:10.

1007/s10865-007-9130-7

Carmody, J., & Baer, R. A. (2009). How long does a mindfulness-based stress reduction program need to be? A review of class contact hours and effect sizes for psychological distress. *Journal of Clinical Psychology, 65*(6), 627–638. doi:10.1002/jclp.20555

Castillo, R. J. (1990). Depersonalization and meditation. *Psychiatry, 53*(2), 158–168. Retrieved from http://search.proquest.com/docview/1301446586?accountid=14701

Chadwick, P., Hughes, S., Russell, D., Russell, I., & Dagnan, D. (2009). Mindfulness groups for distressing voices and paranoia: a replication and randomized feasibility trial. *Behavioural and Cognitive Psychotherapy, 37*(4), 403. doi:10.1017/S1352465809990166

Chajut, E., & Algom, D. (2003). Selective attention improves under stress: Implications for theories of social cognition. *Journal of Personality and Social Psychology, 85*(2), 231–248. doi:10.1037/0022-3514.85.2.231

Cohen, S., & Weinstein, N. (1981). Non auditory effects of noise on behavior and health. *Journal of Social Issues, 37*(1), 36–70. doi:10.1111/j.1540-4560.1981.tb01057.x

Conan-Doyle, A. (2001). Adventures of Sherlock Holmes. In E. Glinert (Ed.), *The adventures and memoirs of Sherlock Holmes.* London: Penguin. (Original work published 1892)

Crane, C., & Williams, J. M. G. (2010). Factors associated with attrition from mindfulness based cognitive therapy for suicidal depression. *Mindfulness, 1*(1), 10–20. doi:10.1007/s12671010-0003-8

Davidson, R. J., Kabat-Zinn, J., Schumacher, J., Rosenkranz, M., Muller, D., Santorelli, S. F., . . . Sheridan, J. F. (2003). Alterations in brain and immune function produced by mindfulness meditation. *Psychosomatic Medicine, 65*(4), 564–570. doi:10.1097/01.

PSY.0000077505.67574.E3

Denckla, M. B. (1996). A theory and model of executive function: A neuropsychological perspective. In Lyon, G. R., and Krasnegor, N. A. (eds.), *Attention, Memory, and Executive Function,* Paul H. Brookes, Baltimore, MD, pp. 263–277.

Dennis, M. (1991). Frontal lobe function in childhood and adolescence: A heuristic for assessing attention regulation, executive control, and the intentional states important for social discourse. *Developmental Neuropsychology, 7*(1), 327–358. doi:10.1080/87565649109540497

Derisley, J., & Reynolds, S. (2000). The transtheoretical stages of change as a predictor of premature termination, attendance and alliance in psychotherapy. *The British Journal of Clinical Psychology, 39*(4), 371–82. doi:10.1348/014466500163374

De Shazer, S., Dolan, Y. M., & Korman, H. (2007). *More than miracles. The state of the art of solution-focused brief therapy*. Haworth Press.

Devilly, G.J. (2005). *ClinTools Software for Windows: Version 4.* Psytek, Ltd. Retrieved from http://www.clintools.com

DiPerna, J. C., & Elliott, S. N. (2001). *The Academic Competence Evaluation Scales* (ACES College). San Antonio, TX: The Psychological Association.

Dobkin, P. L., Irving, J. A., & Amar, S. (2011). For whom may participation in a mindfulness-based stress reduction program be contraindicated? *Mindfulness, 3*(1), 44–50. doi:10.1007/s12671011-0079-9

Donker, T., Griffiths, K. M., Cuijpers, P., & Christensen, H. (2009). Psychoeducation for depression, anxiety and psychological distress: a meta-analysis. *BMC medicine*, *7*(1), 79. doi:10.1186/1741-7015-7-79

Dunn, B. R., Hartigan, J. A., & Mikulas, W. L. (1999). Concentration and mindfulness meditations: unique forms of consciousness? *Applied Psychophysiology and Biofeedback*, *24*(3), 147-165. doi:10.1023/A:1023498629385

Dunning, D., Heath, C., & Suls, J. M. (2005). Flawed self-assessment: Implications for education, and the workplace. *Psychological Science in the Public Interest, 5*(3), 69–106. doi:10.1111/j.1529-1006.2004.00018.x

DuPaul, G. J., Guevremont, D. C., & Barkley, R. A. (1992). Behavioral treatment of attention-deficit hyperactivity disorder in the classroom: The use of the attention training system. *Behavior Modification, 16*(2), 204–225. doi:10.1177/01454455920162004

Eisenberg, D., Golberstein, E., & Hunt, J. B. (2009). Mental health and academic success in college. *B.E. Journal of Economic Analysis and Policy, 9*(1), 1–35. doi:10.2202/1935-1682.2191

Elgar, F. J. (2003). *PhD degree completion in Canadian universities. Graduate Students Association of Canada.* Retrieved from http://careerchem.com/CAREER-INFO-ACADEMIC/Frank-Elgar.pdf

Elshout, J., & Veenman, M. (1992). Relation between intellectual ability and working method as predictors of learning. *Journal of Educational Research, 85*(3), 134–143. doi:10.1080/00220671.1992.9944429

Engle, C. C., Reilly, N. P., & Levine, H. B. (2003). A case study of an academic retention program. *Journal of College Student Retention*, *5*(4), 365–383. Retrieved from http://baywood.metapress.com/link.asp?target=contribution&id=JP0W5358Y7DJ14B2

Eslinger, P. J. (1996). Conceptualizing, describing, and measuring components of executive function: A summary. In G. R. Lyon & N. A. Krasnegor (Eds.), *Attention, memory, and*

executive function. Baltimore: Brookes.

European Union Life Long Learning Program. (2010). *Stop dropout! Risk detection and flexible prevention against learners' drop out*. Retrieved from http://www.stop-dropout.eu/index.php?id=2&L=0

Everson, H. T., Weinstein, C. E., & Laitusis, V. (2000, April). *Strategic learning abilities as a predictor of academic achievement*. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA.

Felder, R. M., Forrest, K. D., Baker-Ward, L., Dietz, E. J., & Mohr, P. H. (1993). A longitudinal study of engineering student performance and retention: Success and failure in the introductory course. *Journal of Engineering Education, 82*(1), 15–21. doi:10.1002/j.2168-9830.1993.tb00067

Fiebert, M. S., & Mead, T. M. (1981). Meditation and academic performance. *Perceptual & Motor Skills, 53*, 447–450. doi:10.2466/pms.1981.53.2.447

Fisher, R. J., & Katz, J. E. (2000). Social desirability bias and the validity of self-reported values. *Psychology & Marketing, 17*(2), 105–105. doi:10.1002/(SICI)1520-6793(200002)17:2<105::AID-MAR3>3.0.CO;2-9

Flook, L., Smalley, S. L., Kitil, M. J., Galla, B. M., Kaiser-Greenland, S., Locke, J., . . . Kasari, C. (2010). Effects of mindful awareness practices on executive functions in elementary school children. *Journal of Applied School Psychology, 26*(1), 70–95. doi:10.1080/15377900903379125

Franke, R.H., & Kaul, J.D. (1978). The Hawthorne experiments: First statistical interpretation. *American Sociological Review, 43*(5), 623-643. Retrieved from http://search.proquest.com/docview/60821929?accountid=14701

Grencavage, L., Bootzin, R. R., & Shoham,V. (1993). Specific and nonspecific effects in psychological treatments. In: Costello CG, editor. *Basic issues in psychopathology.* New York: Guilford Press

Hall, P. D. (1999). The effect of meditation on the academic performance of African American college students. *Journal of Black Studies, 29*(3), 408–415. doi:10.1177/002193479902900305

Hamilton, S. F., & Hamilton, M. A. (2006). School, work, and emerging adulthood. In Arnett, J. J., & Tanner, J. L. (Eds.) *Emerging adults in America: Coming of age in the 21st century*. (pp. 440–473). Washington, DC: American Psychological Association.

Harris, C. K. (2010). The use of values-enhanced mindfulness-based stress reduction to increase self-care behaviors and well-being in clinical psychology trainees. (Doctoral dissertation). Available from ProQuest, Dissertations and Thesis Database. (UMI No. 3421914)

Hölzel, B. K., Carmody, J., Vangel, M., Congleton, C., Yerramsetti, S. M., Gard, T., & Lazar, S. W. (2011). Mindfulness practice leads to increases in regional brain gray matter density. P*sychiatry Research: Neuroimaging, 191*(1), 36–43. doi:10.1016/j.pscychresns.2010.08.006.

Howell, A. J., & Buro, K. (2010). Relations among mindfulness, achievement-related self-regulation, and achievement emotions. *Journal of Happiness Studies, 12*(6), 1007–1022. doi:10.1007/s10902-010-9241-7

Ivanovski, B., & Malhi, G. S. (2007). The psychological and neurophysiological concomitants of mindfulness forms of meditation. *Acta Neuropsychiatrica, 19*(2), 76–91. doi:10.1111/j.1601-5215.2007.00175.x

Jain, S., Shapiro, S. L., Swanick, S., Roesch, S. C., Mills, P. J., Bell, I., & Schwartz, G. E. I. (2007). A randomized controlled trial of mindfulness meditation versus relaxation training: Effects on distress, positive states of mind, rumination, and distraction. *Annals of Behavioral Medicine, 33*(1), 11–21. doi:10.1207/s15324796abm3301_2

James, W. (1890). *Principles of psychology*. New York: Holt.

James, W. (1892). *Psychology: The briefer course*. New York: Holt.

Jensen, P. S., Weersing, R., Hoagwood, K. E.,& Goldman, E. (2005). What is the evidence for evidence-based treatments? A hard look at our soft underbelly. *Mental Health Services Research, 7*(1), 53–74. doi:10.1007/s11020-005-1965-3

Jha, A. P., Krompinger, J., & Baime, M. J. (2007). Mindfulness training modifies subsystems of attention. *Cognitive, Affective & Behavioral Neuroscience (Print), 7*(2), 109–119. doi:10.3758/CABN.7.2.109

Jha, A. P., Stanley, E. A., Kiyonaga, A., Wong, L., & Gelfand, L. (2010). Examining the protective effects of mindfulness training on working memory capacity and affective experience. *Emotion, 10*(1), 54–64. doi:10.1037/a0018438

Josefsson, T., & Broberg, A. (2011). Meditators and non-meditators on sustained and executive attentional performance. *Mental Health, Religion & Culture, 14*(3), 291–309. doi:10.1080/13674670903578621

Kabat-Zinn, J. (1990). *Full catastrophe living: The program of the stress reduction clinic at the University of Massachusetts Medical Center*. New York: Dell.

Kabat-Zinn, J. (1994). *Wherever you go, there you are: mindfulness meditation in everyday life*. New York: Hyperion.

Kabat-Zinn, J., & Chapman-Waldrop, A. (1988). Compliance with an outpatient stress reduction

program: Rates and predictors of program completion. *Journal of Behavioral Medicine, 11*(4), 333–352. doi:10.1007/BF00844934

Kabat-Zinn, J., Lipworth, L., & Burney, R. (1985). The clinical use of mindfulness meditation for the self-regulation of chronic pain. *Journalof Behavioral Medicine, 8*(2)*,* 162–190. doi:10.1007/BF00845519

Kabat-Zinn, J., Massion, A., Kristeller, J., Peterson, L., Fletcher, K., Pbert, L., . . . Santorelli S. F. (1992). Effectiveness of a meditation-based stress reduction program in the treatment of anxiety disorders. *American Journal of Psychiatry, 149*(7)*,* 936–943. Retrieved from http://search.proquest.com/docview/220478169?accountid=14701

Kang, Y. S., Choi, S. Y., & Ryu, E. (2009). The effectiveness of a stress coping program based on mindfulness meditation on the stress, anxiety, and depression experienced by nursing students in Korea. *Nurse Education Today, 29*(5), 538–543. doi:10.1016/j.nedt.2008.12.003.

Kaplan, S. (1995). The restorative benefits of nature: Toward an integrative framework. *Journal of Environmental Psychology (Print), 15*(3), 169–182. doi:10.1016/0272-4944(95)90001-2

Kaplan, S. (2001). Meditation, restoration, and the management of mental fatigue. *Environment and Behavior, 33*(4)*,* 480–506. doi:10.1177/00139160121973106

Kaplan, S., & Berman, M. G. (2010). Directed attention as a common resource for executive functioning and self-regulation. *Perspectives on Psychological Science, 5*(1), 43–57. doi:10.1177/1745691609356784

Kember, P. (1985). The transcendental meditation technique and postgraduate academic performance. *British Journal of Educational Psychology, 55*(2), 164–166. doi:10.1111/

j.2044-8279.1985.tb02621.x

Kennett, D. J., & Reed, M. J. (2009). Factors influencing academic success and retention following a 1st-year post-secondary success course. *Educational Research and Evaluation, 15*(2), 153–166. doi:10.1080/13803610902804382

Kern, C. W., Fagley, N. S., & Miller, P. M. (1998). Correlates of college retention and GPA: Learning and study strategies, testwiseness, attitudes, and ACT. *Journal of College Counseling, 1*(1), 26–34. doi:10.1002/j.2161-1882.1998.tb00121.x

Kerns, K. A., Eso, K., & Thomson, J. (1999). Investigation of a direct intervention for improving attention in young children with ADHD. *Developmental Neuropsychology, 16*(2), 273–295. doi:10.1207/S15326942DN1602_9

Kessler, R. C, Adler, L., Ames, M., Demler, O., Faraone, S., Hiripi, E., … Walters, E. E. (2005). The World Health Organization adult ADHD self-report scale (ASRS): a short screening scale for use in the general population. *Psychological Medicine, 35*(2), 245–56. doi:10.1017/S0033291704002892

Khong, B. S. L. (2009). Expanding the understanding of mindfulness: Seeing the tree and the forest. *The Humanistic Psychologist, 37*(2), 117–136. doi:10.1080/08873260902892006

Kingston, J., Chadwick, P., Meron, D., & ChasSkinner, T. (2007). A pilot randomized control trial investigating the effect of mindfulness practice on pain tolerance, psychological well-being, and physiological activity. *Journal of Psychosomatic Research, 62*(3), 297-300. doi: 10.1016/j.jpsychores.2006.10.007

Klatt, M. D., Buckworth, J., & Malarkey, W. B. (2009). Effects of low-dose mindfulness-based stress reduction (MBSR-LD) on working adults. *Health Education and Behavior*, *36*(3), 601–614. doi:10.1177/1090198108317627

Koszycki, D., Benger, M., Shlik, J., & Bradwejn, J. (2007). Randomized trial of a meditation-based stress reduction program and cognitive behavior therapy in generalized social anxiety disorder. *Behaviour Research and Therapy, 45*(10), 2518–2526. doi:http://dx.doi.org/10.1016/j.brat.2007.04.011

Krause N. (2006). *History of love*. New York: W. W. Norton & Company

Kuo, F. E. & Taylor, A. F. (2004). A potential natural treatment for attention-deficit/hyperactivity disorder: evidence from a national study. *American Journal of Public Health, 94*(9), 1580–1586. doi:10.2105/AJPH.94.9.1580

Kuyken, W., Byford, S., Taylor, R. S., Watkins, E., Holden, E., White, K., …Teasdale, J. D. (2008). Mindfulness-based cognitive therapy to prevent relapse in recurrent depression. *Journal of Consulting and Clinical Psychology*. *76*(6), 966–978. doi:10.1037/a0013786.

Lau, M. A., Bishop, S. R., Segal, Z. V., Buis, T., Anderson, N. D., Carlson, L., Shapiro, S., & Carmody, L. (2006). The Toronto mindfulness scale: Development and validation. *Journal of Clinical Psychology, 62*(12), 1445–1467. doi:10.1002/jclp.20326

Lazar, S. W., Kerr, C. E., Wasserman, R. H., Gray, J. R., Greve, D. N., Treadway, M. T., … Fischl, B. (2005). Meditation experience is associated with increased cortical thickness. *Neuroreport, 16*(17), 1893–1897. Retrieved from http://www.ncbi.nlm.nih.gov/pmc/articles/pmc1361002/

Lazarus, R. S. (1966). *Psychological stress and the coping process*. New York: McGraw-Hill.

Levesque, C., & Brown, K. W. (2007). Mindfulness as a moderator of the effect of implicit motivational self-concept on day-to-day behavioral motivation. *Motivation and Emotion, 31*(4), 284–299. doi:http://dx.doi.org/10.1007/s11031-007-9075-8

Lovibond, S. H., & Lovibond, P. F. (1995). *Manual for the depression anxiety stress scales*. Sydney: Psychology Foundation.

Luders, E., Toga, A. W., Lepore, N., & Gaser, C. (2009). The underlying anatomical correlates of long-term meditation: Larger hippocampal and frontal volumes of gray matter. *NeuroImage, 45*(3), 672–678. doi:http://dx.doi.org/10.1016/j.neuroimage.2008.12.061

Lynch, G. V. (2004). Patient variables associated with treatment completion in mindfulness meditation-based stress reduction (MBSR) treatment for fibromyalgia: implications for prescriptive matching and participation enhancement. (Doctoral dissertation). Available from ProQuest, Dissertations and Thesis Database. (UMI No. 3134190)

Lynch, S., Gander, M., Kohls, N., Kudielka, B., & Walach, H. (2011). Mindfulness-based coping with university life: A non-randomized wait-list-controlled pilot evaluation. *Stress and Health, 27*(5), 365–375. doi:10.1002/smi.1382

Ma, S. H., & Teasdale, J. D. (2004). Mindfulness-based cognitive therapy for depression: Replication and exploration of differential relapse prevention effects. *Journal of Consulting and Clinical Psychology, 72*(1), 31–40. doi:10.1037/0022-006X.72.1.31.

Ma, X., & Frempong, G. (2008). Reasons for non-completion of postsecondary education and profile of postsecondary dropouts. *Learning policy directorate strategic policy and research, human resources and social development Canada SP-837-05-08E*. Retrieved from http://www.hrsdc.gc.ca/eng/publications_resources/learning_policy/sp_837_05_08e/sp_837_05_08e.pdf

MacDonald, R. R., & Labuc, S. (1982). *Parachuting stress and performance* (memorandum 82m511). Farnsborough, England: Army Personnel Research Establishment.

Masicampo, E. J., & Baumeister, R. F. (2008). Toward a physiology of dual-process reasoning

and judgment: Lemonade, willpower, and expensive rule-based analysis. *Psychological Science, 19*(3)*,* 255–260. doi:10.1111/j.1467-9280.2008.02077.x

Meltzer, L., Sales Pollica, L., & Barzillai, M. (2007). Executive function in the classroom; Embedding strategy instruction into daily teaching practices. In Meltzer, L., *Executive Function in Education,* from theory to practice. New York: The Guilford Press.

Mendelson, T., Greenberg, M. T., Dariotis, J. K., Gould, L. F., Rhoades, B. L., & Leaf, P. J. (2010). Feasibility and preliminary outcomes of a school-based mindfulness intervention for urban youth. *Journal of abnormal child psychology, 38*(7), 985–994. doi:10.1007/s10802-010-9418-x

Misra, R., & McKean, M. (2000). College students' academic stress and its relation to their anxiety, time management, and leisure satisfaction. *American Journal of Health Studies, 16*(1), 41–51. Retrieved from http://www.biomedsearch.com/article/College-studentsacademic-stress-its/65640245.html

Miyake, A., Friedman, N. P., Emerson, M. J., Witzki, A. H., Howerter, A., & Wager, T. D. (2000). The unity and diversity of executive functions and their contributions to complex "frontal lobe" tasks: A latent variable analysis. *Cognitive Psychology, 41*(1), 49–100. doi: 10.1006/cogp.1999.0734

Morris, R. D. (1996). Relationships and distinctions among the concepts of attention, memory, and executive function: A developmental perspective. In Lyon, G. R., and Krasnegor, N. A. (Eds.), *Attention, Memory, and Executive Function,* Paul H. Brookes, Baltimore, pp. 11–16.

Mulligan, N. W. (1998). The role of attention during encoding in implicit and explicit memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 24*(1), 27–47.

doi:10.1037/0278-7393.24.1.27

Muraven, M. & Baumeister, R. F. (2000) Self-regulation and depletion of limited resources: does self control resemble a muscle? *Psychology Bulletin, 126*(2)*,* 247–259. doi: I0.I037// 0033-2909.126.2.247

Muraven, M., Baumeister, R. F., & Tice, D. M. (1999). Longitudinal improvement of self-regulation through practice: Building self-control strength through repeated exercise. *The Journal of Social Psychology*, *139*(4), 446–457. doi:10.1080/00224549909598404

Murdock, M. (2012). *Personal e-mail communication with the manager of Health Services at Carleton University.*

Norman, D. A., & Shallice, T. (1986). Attention to action: Willed and automatic control of behaviour. In Davidson, R. J., Shwartz, G. E., & Shapiro, D. *Consciousness and Self-regulation: Advances in research and theory* (Vol. 4, pp. 1–18). New York: Plenum.

Oaten, M., & Cheng, K. (2006). Improved self-control: The benefits of a regular program of academic study. *Basic and Applied Social Psychology, 28*(1), 1–16. doi:10.1207/ s15324834basp2801_1

Oman, D., Shapiro, S. L., Thoresen, C. E., Plante, T. G., & Flinders, T. (2008). Meditation lowers stress and supports forgiveness among college students: A randomized controlled trial. *Journal of American College Health, 56*(5), 569-78. Retrieved from http://search.proquest.com/docview/213069697?accountid=14701

Ontario Ministry of Education.(2013). *Elementary and Secondary Report Card Updates.* Retrieved from http://www.edu.gov.on.ca/eng/document/forms/report/card/ HS_NonSemester_Final.pdf

Ontario Ministry of Finance. (2010). *Ontario's Long-Term Report on the Economy.* Retrieved

from http://www.fin.gov.on.ca/en/economy/ltr/2010/

Papageorgiou, C., & Wells, A. (2001). Metacognitive beliefs about rumination in recurrent major depression. *Cognitive and Behavioral Practice, 8*(1), 160–164. doi:http://dx.doi.org/10.1016/S1077-7229(01)80021-3,

Paterniti, A. (2007). *A pilot study comparing the efficacy of a mindfulness-based program to a skills-training program in the treatment of test anxiety.* (Doctoral dissertation). Available from ProQuest, Dissertations and Thesis Database. (UMI No. 3285794)

Pintrich, P. (2000). The role of goal orientation in selfregulated learning. In M. Boekaerts, P. Pintrich, and M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 451–502). San Diego. CA: Academic Press.

Pintrich, P. R., McKeachie, W. J., & Smith, D. (1989). *The Motivated Strategies for Learning Questionnaire (MSLQ).* Ann Arbor, MI: National Center for Research to Improve Post-Secondary Teaching and Learning.

Polansky, J., Horan, J. J., & Hanish, C. (1993). Experimental construct validity of the outcomes of study skills training and career counseling as treatments for the retention of at-risk students. *Journal of Counseling and Development*, *71*(5), 488–492. doi:10.1002/j.1556-6676.1993.tb02230.x

Prochaska, J.O., Diclemente, C.C. & Norcross, J.C. (1992). In search of how people change-Applications to addictive behaviors. *American Psychologist, 47*(9), 1102–1114. Retrieved from http://search.proquest.com/docview/37397784?accountid=14701

Rabiner, D. L., Murray, D. W., Skinner, A. T., & Malone, P. S. (2010). A randomized trial of two promising computer-based interventions for students with attention difficulties. *Journal of Abnormal Child Psychology: An Official Publication of the International*

Society for Research in Child and Adolescent Psychopathology, 38(1), 131–142. doi:10.1007/s10802-009-9353-x

Rafidah, K., Azizah, A., Norzaidi, M. D., Chong, S. C., Salwani, M. I., & Noraini, I. (2009). Stress and academic performance: Empirical evidence from university students. *Academy of Educational Leadership Journal, 13*(1), 37–51. Retrieved from http://www.freepatentsonline.com/article/Academy-Educational-Leadership-Journal/208747713.html

Ramel W., Goldin P. R., Carmona P. E., & McQuaid J. R. (2004). The effects of mindfulness meditation on cognitive processes and affect in patients with past depression. *Cognitive Therapy and Research, 28*(4)*,* 433–455. doi:10.1023/B:COTR.0000045557.15923.96

Reid, R., Trout, A. L., & Schartz, M. (2005). Self-regulation interventions for children with attention deficit/hyperactivity disorder. *Exceptional Children, 71*(4), 361–361. Retrieved from http://search.proquest.com/docview/62150441?accountid=14701

Rogers, E. S., Rose, M., Anthony, W., Massaro, J., & Danley, K., Crean, T., & Renk, W. (2001). Assessing readiness for change among persons with severe mental illness. *Community Mental Health Journal, 37*(2), 97–112. doi:10.1023/A:1002705614293

Rohrmann, S., Hennig, J., & Netter, P. (1999). Changing psychobiological stress reactions by manipulating cognitive processes. *International Journal of Psychophysiology, 33(1)*, 149–161. doi:10.1016/S0167-8760(99)00036-7

Schmidt, R. (1995). *Attention and awareness in foreign language learning*. Honolulu: University of Hawai'i Press

Schwartz, C. E. C., Chesney, M. A. M., Irvine, M. J. M., & Keefe, F. J. F. (1997). The control group dilemma in clinical research: Applications for psychosocial and behavioral medicine trials. *Psychosomatic Medicine, 59*(4), 362–371. doi:0033-3174/97/5904-

0362$03.00/0

Scott, C. L., & Homant, R. J. (2007). The professional mentor program plus: An academic success and retention tool for adult learners. *Journal of College Student Retention*, *9*(1), 61–73. doi:10.2190/D370-4767-PT35-47U8

Segal, Z. V., Bieling, P., Young, T., MacQueen, G., Cooke, R., Martin, L., . . . Levitan, R. D., (2010). Antidepressant monotherapy vs. sequential pharmacotherapy and mindfulness-based cognitive therapy, or placebo, for relapse prophylaxis in recurrent depression. *Archives of General Psychiatry, 67*(12), 1256–1264. doi:10.1001/archgenpsychiatry. 2010.168

Segal, Z. V., Williams, J. M. G., & Teasdale, J. D. (2002). *Mindfulness-based cognitive therapy for depression*. New York: The Guilford Press.

Shaienks, D., Gluszynski, T., & Bayard, J. (2005). Postsecondary education – Participation and dropping out: Differences across university, college and other types of postsecondary institutions. *Statistics Canada, 81–595-M — No. 070*. Retrieved from http://www.statcan. gc.ca/pub/81-595-m/81-595-m2008070-eng.pdf

Shallice, T. (1982). *Specific impairments of planning.* Philosophical Transcripts of the Royal Society of London, B298, 199–209.

Shao, R., & Skarlicki, D. P. (2009). The role of mindfulness in predicting individual performance. *Canadian Journal of Behavioural Science, 41*(4), 195–201. doi:10.1037/a0015166

Shapiro, D. H. (1992). Adverse effects of meditation: A preliminary investigation of long-term meditators. *International Journal of Psychosomatics: Official Publication of the International Psychosomatics Institute, 39*(1-4), 62–67. Retrieved from

http://search.proquest.com/docview/73311657?accountid=14701

Shapiro, S. L., & Schwartz, G. E. R. (1999). The role of intention in self-regulation: Toward intentional systemic mindfulness. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 253–273). New York: Academic Press.

Shapiro, S. L., & Schwartz, G. E. R. (2000). Intentional systemic mindfulness: An integrative model for self-regulation and health. *Advances in Mind-Body Medicine, 16*(2), 128–135. Retrieved from http://search.proquest.com/docview/71158403?accountid=14701

Shapiro, S. L., Carlson, L. E., Astin, J. A., & Freedman, B. (2006). Mechanisms of mindfulness. *Journal of Clinical Psychology, 62*(3), 373–386. doi:10.1002/jclp.20237

Sheilds, N. (2001). Stress, active coping, and academic performance among persisting and nonpersisting college students. *Journal of Applied Biobehavioral Research, 6*(2), 65–81. doi:10.1111/j.1751-9861.2001.tb00107.x

Siegel, D. J. (2007). Mindfulness training and neural integration: Differentiation of distinct streams of awareness and the cultivation of well-being. *Social Cognitive and Affective Neuroscience, 2*(4), 259–263. doi:10.1093/scan/nsm034

Smallwood, J., Fishman, D. J., & Schooler, J. W. (2007). Counting the cost of an absent mind: Mind wandering as an underrecognized influence on educational performance. *Psychonomic Bulletin & Review, 14*(2), 230–236. doi:10.3758/BF03194057

Smallwood, J., McSpadden, M., & Schooler, J. W. (2008). When attention matters: The curious incident of the wandering mind. *Memory & Cognition, 36*(6), 1144–1150. doi:10.3758/MC.36.6.1144

Sohlberg, M. M., & Mateer, C. A. (2001). Improving attention and managing attentional problems. adapting rehabilitation techniques to adults with ADD. *Annals of the New York*

Academy of Sciences, 931, 359–375. doi:10.1111/j.1749-6632.2001.tb05790.x

Staal, M. A. (2004). *Stress, cognition, and human performance: A literature review and conceptual framework*. NASA Ames Research Center: Technical Memorandum. Retrieved from: http://human-factors.arc.nasa.gov/flightcognition/Publications/IH_054_Staal.pdf

Stadler, M. A. (1995). Role of attention in implicit learning. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 21*(3), 674–685. doi:10.1037/0278-7393.21.3.674

Statistics Canada (2008) *Average time to completion by field of study, 2005/2006.* Retrieved from http://www.statcan.gc.ca/pub/81-595-m/2008069/app-ann1/5800145-eng.htm

Statistics Canada (2009). *University tuition fees, 2009/2010.* Retrieved from http://www.statcan.gc.ca/daily-quotidien/091020/dq091020b-eng.htm

Sternberg, R., & Kaufman, J. (1998). Human abilities. *Annual Review of Psychology, 49,* 479–502. doi:10.1146/annurev.psych.49.1.479

Stuss, D. T. D. (2006). Frontal lobes and attention: Processes and networks, fractionation and integration. *International Neuropsychological Society Journal, 12*(2), 261–271. doi:10.1017/S1355617706060358

Stuss, D. T. D., & Alexander, M. P. M. (2000). Executive functions and the frontal lobes: A conceptual view. *Psychological Research, 63*(3-4), 289–298. doi:10.1007/s004269900007

Stuss, D. T. D., Shallice, T., Alexander, M. P. M., & Picton, T. W. (1995). A multidisciplinary approach to anterior attentional functions. *Annals of the New York Academy of Science, 769,* 191–212. doi:0.1111/j.1749-6632.1995.tb38140.x

Suchy, Y. Y. (2009). Executive functioning: Overview, assessment, and research issues for non-neuropsychologists. *Annals of Behavioral Medicine: A Publication of the Society of Behavioral Medicine, 37*(2), 106–116. doi:10.1007/s12160-009-9097-4

Tabachnick B. G. & Fidell L.S. (1983). *Using multivariate statistics: A practical approach to using multivariate analyses*. New York: Harper & Row

Teasdale, J. D. (1999). Metacognition, mindfulness, and the modification of mood disorders. *Clinical Psychology and Psychotherapy, 6*(2), 146–155. doi:10.1002/(SICI)1099-0879(199905)6:2<146::AID-CPP195>3.0.CO;2-E

Teasdale, J. D., Segal, Z. V., & Williams, J. M. G. (1995). How does cognitive therapy prevent depressive relapse and why should attentional control (mindfulness) training help? *Behaviour Research and Therapy, 33*(1), 25–39. doi:10.1016/0005-7967(94)E0011-7

Teasdale, J. D., Segal, Z. V., Williams, J. M. G., Ridgeway, V. A., Soulsby, J. M., & Lau, M. A. (2000). Prevention of relapse/recurrence in major depression by mindfulness-based cognitive therapy. *Journal of Consulting and Clinical Psychology, 68*(4), 615–623. doi:10.1037/0022-006X.68.4.615

Thabane, L., Ma, J., Chu, R., Cheng, J., Ismaila, A., Rios, L.P., Robson, R., Thabane, M., Goldsmith, C.H. (2010). A tutorial on pilot studies: The what, why and How. *BMC Medical Research Methodology 10*(1). doi:10.1186/1471-2288-10-1

Thompson, A. (2010). *A meta-analysis of university and college student retention programs*. Carleton University, unpublished work produced for FIT: ACTION retention program.

Thompson, A. (2011). *From intention to action (FIT: Action): Preliminary evaluation report*. Carleton University, unpublished work produced for FIT: ACTION retention program.

Toneatto, T., & Nguyen, L. (2007). Does mindfulness meditation improve anxiety and mood

symptoms? A review of the controlled research. *The Canadian Journal of Psychiatry/La Revue canadienne de psychiatri*e, *52*(4), 260–266. Retrieved from http://web.ebscohost.com.proxy.bib.uottawa.ca/ehost/pdfviewer/pdfviewer?vid=3&sid=c3e1e329-7cb7-4c21-a192-900237d2aea2%40sessionmgr4&hid=22

Treisman, A. M., & Riley, J. G. J. (1969). Is selective attention selective perception or selective response? A further test. *Journal of Experimental Psychology, 79*(1), 27–34. doi:10.1037/h0026890

Trockel, M. T., Barnes, M. D., & Egget, D. L. (2000). Health-related variables and academic performance among first-year college students: Implications for sleep and other behaviors. *Journal of American College Health, 49*(3), 125–31. doi:10.1080/07448480009596294

Valentine, E. R., & Sweet, P. L. G. (1999). Meditation and attention: a comparison of the effects of concentrative and mindfulness meditation on sustained attention. *Mental Health, Religion and Culture, 2*(1), 59–70. doi:10.1080/13674679908406332

Vettese, L. C., Toneatto, T., Stea, J. N., Nguyen, L., & Wang, J. J. (2009). Do mindfulness meditation participants do their homework? And does it make a difference? A review of the empirical evidence. *Journal of Cognitive Psychotherapy, 23*(3), 198–225. doi:10.1891/0889-8391.23.3.198

Vickers, A. J. (2005). Analysis of variance is easily misapplied in the analysis of randomized trials: a critique and discussion of alternative statistical approaches. *Psychosomatic Medicine, 67*(4), 652–655. doi:10.1097/01.psy.0000172624.52957.a8

Vickers, A. J., & Altman, D. G. (2001). Analysing controlled trials with baseline and follow up measurements. Br Med J 323:1123–1124 Wickens, C. D., & McCarley, J. S. (2008).

Applied attention theory. Boca Raton: CRP Press.

Weider, G., Kohlman C. W., Dotzauer, E., & Burns, L. R. (1996). The effects of academic stress on health behaviors in young adults. *Anxiety, Stress & Coping, 9*(2), 123–133. doi:10.1080/10615809608249396

Weinstein, C. E., Schulte, A. C., & Palmer, D. R. (1987). *LASSI: Learning and study strategies inventory*. Clearwater, FL: H&H Publishing.

Weinstein, C. E., & Palmer, D. R. (2002). *User manual learning and study strategies inventory.* Second edition. H & H publishing Company, Inc.

Wells, A. (2002). GAD, Metacognition, and mindfulness: an informational processing analysis. *Clinical Psychology: Science and Practice, 9*(1), 95–100. doi:10.1093/clipsy.9.1.95

Wells, A. (2008). Metacognitive therapy: Cognition applied to regulating cognition. *Behavioural and Cognitive Psychotherapy, 36*(6), 651–658. doi:10.1017/S1352465808004803

Wells, N. M. (2000). At home with nature: effects of "greenness" on children's cognitive functioning. *Environmental Behaviour, 32*(6)*,* 775–795. doi:10.1177/00139160021972793

Welsh, M. C., & Pennington, B. F. (1988). Assessing frontal lobe functioning in children: Views from developmental psychology. *Developmental Neuropsychology, 4*(3)*,* 199–230. doi:10.1080/87565648809540405

Wentzel, K. R., & Wigfield, A. (1998). Academic and social motivational influences on students' academic performance. *Educational Psychology Review, 10*(2), 155–175. doi:10.1023/A:1022137619834

Wickens, C., & McCarley, J. (2008). *Applied attention theory*. BocaRaton, FL: Taylor & Francis

Wiebe, S. A., Espy, K. A., & Charak, D. (2008). Using confirmatory factor analysis to

understand executive control in preschool children: I. Latent structure. *Developmental Psychology, 44*(2)*,* 575–587. doi:10.1037/0012-1649.44.2.575

Williams, P. G., Suchy, Y., & Rau, H. K. (2009). Individual differences in executive functioning: Implications for stress regulation. *Annals of Behavioral Medicine, 37*(2), 126–140. doi: 10.1007/s12160-009-9100-0

Wintre, M. G., Bowers, C., Gordner, N., & Lange, L. (2006). Re-evaluating the university attrition statistic**:** A longitudinal follow-up study. *Journal of Adolescent Research*, *21*(2), 111–132. doi:10.1177/0743558405285658

Zeidan, F., Johnson, S. K., Diamond, B. J., David, Z., & Goolkasian, P. (2010). Mindfulness meditation improves cognition: Evidence of brief mental training. *Consciousness and Cognition, 19*(2), 597–605. doi:10.1016/j.concog.2010.03.014

Zerbe, W. J., & Paulhus, D. L. (1987). Socially desirable responding in organizational behavior: A reconception. *Journal of Management Review, 12*(2), 250–264. Retrieved from http://search.proquest.com/docview/210934749?accountid=14701

Zimmerman, B. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. Pintrich, & M. Zeidner (Eds.), *Handbook of self reflation* (pp. 13–39). San Diego, CA: Academic Press.

Zylowska, L. (2012). *The mindfulness prescription for adult ADHD: An 8-step program for strengthening attention, managing emotions, and achieving your goals.* Boston, MA: Trumpeter Books, Shambhala Publications

Zylowska, L., Ackerman, D. L., Yang, M. H., Futrell, J. L., Horton, N. L., Hale, T. S., … Smalley, S. L. (2008). Mindfulness meditation training in adults and adolescents with ADHD: A feasibility study. *Journal of Attention Disorders, 11*(6), 737–746.

doi:10.1177/1087054707308502

Appendix A: Informed Consent

uOttawa

Université d'Ottawa
Faculté d'éducation

University of Ottawa
Faculty of Education

Informed Consent to Participate in a Research Study

This study has received clearance by the University of Ottawa Social Sciences and Humanities Research Ethics Board (06-12-16) and by Carleton University Psychology Research Ethics Board.

Study title: Feasibility study: Can mindfulness practice benefit executive function and improve academic performance?

Research team: Zsuzsanna Grandpierre, M.A. candidate at University of Ottawa, Faculty of Education, Department of Educational Counselling

Diana Koszycki, Ph.D., C.Psych., Full Professor at University of Ottawa, Faculty of Education, Department of Educational Counselling

Purpose of the study: This research study aims to establish the feasibility of delivering the mindfulness for academic success (MAS) program to university students who are experiencing difficulties with their academic performance. The study also investigates the effect of MAS on executive functions (EF), academic performance, and stress.

Description and procedure: You are here today to complete the pre-study assessment. This assessment will take approximately one hour and includes questionnaires about your academic status and performance, and mindfulness plus two tests that measure your executive functions. You will be assigned by a toss of a coin to either begin the MAS program immediately following the pre-study assessment or six weeks later. Sessions will take place either at Carleton University, 501 University Center, 1125 Colonel By Drive or in the Community Counselling Boardroom at University of Ottawa, 283 Lamoureux Hall (LMX), 145 Jean-Jacques-Lussier Private.

MAS is a meditation-based program that incorporates both formal (sitting meditation, body scan, yoga) and informal practices, such as paying attention to any daily activity. The program consists of six weekly 1.5-hour group sessions, where you will learn these techniques and have an opportunity to discuss your experiences with mindfulness. In addition to

Tel/Tél : 613-562-5804
Fax/Téléc :613-562-5144

145, Jean-Jacques Lussier
Ottawa ON K1N 6N5
Canada

www.education.uOttawa.ca

attending these sessions, you are also required to complete 25 minutes of daily home practice, which consists of short written assignments and practicing formal and informal mindfulness. You will have to log the frequency and length of your practice on the same website where you have registered.

Regardless of when you begin the MAS program you will complete the post-study assessment 6 weeks later. This assessment will follow the same format as the pre-study assessments. Your pre and post-study assessments will be compared to establish if attending the MAS program influenced your executive functions (EF), academic performance, and stress levels.

Part of our quality assurance program requires that all the group sessions be audiotaped. By doing this we make sure that the mindfulness instructor is competent in delivering the MAS program. Only Dr. Koszycki will review these tapes.

Risks and benefits: There are no known risks associated with filling out the questionnaires, performing the executive function tests or participating in mindfulness-based programs. Filling out the questionnaires may increase your self-awareness. If you have any questions or concerns about what you have learnt about yourself you may contact Dr. Diana Koszycki at University of Ottawa who will provide you with an appropriate community referral.

During the group discussions you might also experience some shyness, anxiety or discomfort when talking about your mindfulness experiences. For this reason participation in discussion is voluntary, and you may choose not talk or answer any questions.

Participating in the MAS program is time consuming. However, the practice of mindfulness has been associated with increased psychological and physical well-being; therefore, you might experience similar benefits.

Confidentiality: The data collected in this study will be kept confidential. Your informed consent form will be separated from your questionnaire to ensure that your name is not kept with the survey.

Data conservation: A number code will be assigned to the rest of the information and entered into an electronic database. The database will be password-protected and hard copies will be kept in a locked office in the Faculty of Education at the University of Ottawa for five years following the completion of the study. Access to all information will be limited to the researcher and her supervisor.

Anonymity: In order to keep your information confidential the electronic registration process will generate an internal 5-digit code for your file. This number rather than your name will be associated with all of your electronic and hard copy information and the document that connects your name and identification number will be kept on the password protected computer accessible only by the principal researchers.

Because the study's intervention will be delivered in a group format, your cannot have expectations for confidentiality in the group setting. While you may freely share your own MAS program experiences with others, we will ask you to sign a confidentiality agreement, which requires that you do not disclose other group member's information. This measure is in place to protect the privacy of all group members, and every participant is expected to sign this agreement.

Incentive: The MAS program and all material distributed during the session are free of charge and you will not be compensated for participating in this study. However, students who: (1) complete at least 70% of their homework; (2) attend at least 5 sessions; and (3) complete the post-study assessments (this is the only requirement for wait-list participants) will have a chance to win one of the three $50.00 gift cards to the Rideau Center. These will be raffled following post-study assessments. You will be notified by e-mail if you are the winner of a gift card and you will have to answer a skill testing question to retrieve your prize.

Voluntary participation: Your participation in this study is entirely voluntary. At any point during the study you have the right to not complete certain questions or to withdraw without suffering any negative consequences. If you withdraw from the study your data will be immediately destroyed.

Questions: If you have any questions about this study, you can contact Zsuzsanna Grandpierre or Dr. Diana Koszycki. Should you have any ethical or other concerns about this study, please contact the Protocol Officer for Ethics in Research, University of Ottawa, Tabaret Hall, 550 Cumberland Street, Room 154, Ottawa, ON, K1N 6N5, (613) 562-5387, ethics@uottawa.ca

Thank you for your interest in our research and for your assistance with this project.

uOttawa

Université d'Ottawa
Faculté d'éducation

University of Ottawa
Faculty of Education

Informed Consent Form

Study title: Feasibility study: Can mindfulness practice benefit executive function and improve academic performance?

Research team: Zsuzsanna Grandpierre, M.A. candidate at University of Ottawa, Faculty of Education, Department of Educational Counselling

Diana Koszycki, Ph.D., C.Psych., Full Professor at University of Ottawa, Faculty of Education, Department of Educational Counselling

I_____ agree to participate in the research study described above. I understand that my participation in this study is entirely voluntary and that I may withdraw from the study at any time without any prejudice to myself or to any treatment that I may seek now or in the future. The purposes of the study, the particulars of my involvement and possible hazards and inconveniences have been explained to my satisfaction. I understand that I may contact the researchers if I have any questions about the study. My signature also indicates that I have received a copy of this consent form to keep.

I_____ agree not to disclose any information about a group member to others. This measure is in place to protect the privacy of all group members. Your signature indicates your compliance with this requirement.

There are two copies of the consent form, one of which is mine to keep.

Signature of participant: _____

Date: _____

Person obtaining consent

Name: _____

Signature: _____

Date: _____

Tel/Tél : 613-562-5804
Fax/Téléc :613-562-5144

145, Jean-Jacques Lussier
Ottawa ON K1N 6N5
Canada

www.education.uOttawa.ca

Incentive Information

To thank you for your contribution to this research project, you will be given the option to enter your name in a draw to win one a $50 cash prizes. To be eligible to participate in this draw you will have to: (1) complete at least 70% of the homework; (2) attend at least 5 sessions; and (3) complete the post-study assessments, which is the only requirement for all wait-list participants. If you are eligible to participate in the draw, you will still have to enter the draw by providing your name and e-mail address on a piece of paper and placing it into a box, which will be otherwise locked. You will be asked to do this at the end of your post-study assessments.

After everybody completed their post-study assessments three names will be randomly pulled form amongst those who have entered the draw and the person whose name is drawn will be informed by e-mail. To win the prize, the person must correctly answer a skill-testing question. If the person cannot be reached within 14 days from the date of the draw, a new name will be pulled and the prize will be awarded to that person and so on until the prize has been awarded. The odds of winning a prize are approximately 30%.The prize must be accepted as awarded or forfeited and cannot be redeemed for cash.

Your name and e-mail address that you provide when you enter the draw is collected for the purposes of contacting you if your name is selected in the draw. Your name and the contact information you have provided will be kept confidential and then destroyed once the prizes have been awarded.

This draw is governed by the applicable laws of Canada.

Homework Reminder Signup Sheet

You will receive daily reminders by e-mail to complete and log your homework. Participants in our pilot projects suggested that receiving SMS or Facebook reminders would have been also helpful. If you would like to get either of these reminders please provide the appropriate information. Please rest assured that you will not receive any other information via these methods and your contact information will be protected.

Cell phone number:_____

Facebook link:_____

You may also want to join the *MAS program* on Facebook. Here you will be able to discuss your mindfulness experiences and chat with other participants during the week. Only current group members will have access to this Facebook account.

I want to join (Please indicate by √) : Yes___ No___

Facebook link:_____

Appendix B: Questionnaires

Demographic Information Questionnaire (DIQ)

Sex (Indicate with √): Female___ Male___

Age: _____

What is your current year of study at Carleton University? (Indicate with √)

_____ 1st year _____ 2nd year _____ 3rd year _____ 4th year

_____ Master's program _____ Doctoral program

Why do you think you are having a problem with your academic performance?

_____

_____

_____

Are you familiar with mindfulness practice? (Indicate with √)

_____1 (Not at all) _____2 (Heard about it) _____3 (Read up on it)

How often do you practice mindfulness meditation in a week? _____

How committed are you to attend all six sessions of the MAS program? (Indicate with √)

_____1 (Not at all) _____2 (Somewhat) _____3 (Moderately) _____4 (Extremely)

Can you fit 20 minutes of daily homework into your schedule? (Indicate with √)

_____1 (Not at all) _____2 (Somewhat) _____3 (Moderately) _____4 (Extremely)

Are you currently experiencing symptoms from these diagnosed mental health illness?

(Indicate with √) _____Bipolar Disorder _____PTSD _____ Major depression

Have you ever been diagnosed with Schizophrenia (Indicate with √) _____

Do you currently suffer from: (Indicate with √)

_____Psychosis _____ Suicidal ideations _____ Serious Alcohol or Drug Abuse

Have you ever been diagnosed with: (Indicate with √)

_____ Learning Disability; Please describe: _____

_____ Attention Deficit Disorder

Toronto Mindfulness Scale (TMS)

We are interested in what you just experienced. Below is a list of things that people sometimes experience. Please read each statement. Next to each statement are five choices: "not at all," "a little," "moderately," "quite a bit," and "very much." Please indicate the extent to which you agree with each statement. In other words, how well does the statement describe what you just experienced, just now?

	Not at all	**A little**	**Moderately**	**Quite a bit**	**Very much**
1. I experienced myself as separate from my changing thoughts and feelings.	☐	☐	☐	☐	☐
2. I was more concerned with being open to my experiences than controlling or changing them.	☐	☐	☐	☐	☐
3. I was curious about what I might learn about myself by taking notice of how I react to certain thoughts, feelings or sensations.	☐	☐	☐	☐	☐
4. I experienced my thoughts more as events in my mind than as a necessarily accurate reflection of the way things 'really' are.	☐	☐	☐	☐	☐
5. I was curious to see what my mind was up to from moment to moment.	☐	☐	☐	☐	☐
6. I was curious about each of the thoughts and feelings that I was having.	☐	☐	☐	☐	☐
7. I was receptive to observing unpleasant thoughts and feelings without interfering with them.	☐	☐	☐	☐	☐
8. I was more invested in just watching my experiences as they arose, than in figuring out what they could mean.	☐	☐	☐	☐	☐
9. I approached each experience by trying to accept it, no matter whether it was pleasant or unpleasant.	☐	☐	☐	☐	☐
10. I remained curious about the nature of each experience as it arose.	☐	☐	☐	☐	☐
11. I was aware of my thoughts and feelings without over identifying with them.	☐	☐	☐	☐	☐
12. I was curious about my reactions to things.	☐	☐	☐	☐	☐
13. I was curious about what I might learn about myself by just taking notice of what my attention gets drawn to.	☐	☐	☐	☐	☐

ADHD self-report scale (ASRS)

Patient Name		Today's Date					
Please answer the questions below, rating yourself on each of the criteria shown using the scale on the right side of the page. As you answer each question, place an X in the box that best describes how you have felt and conducted yourself over the past 6 months. Please give this completed checklist to your healthcare professional to discuss during today's appointment.			Never	Rarely	Sometimes	Often	Very Often
1. How often do you have trouble wrapping up the final details of a project, once the challenging parts have been done?							
2. How often do you have difficulty getting things in order when you have to do a task that requires organization?							
3. How often do you have problems remembering appointments or obligations?							
4. When you have a task that requires a lot of thought, how often do you avoid or delay getting started?							
5. How often do you fidget or squirm with your hands or feet when you have to sit down for a long time?							
6. How often do you feel overly active and compelled to do things, like you were driven by a motor?							
							Part A
7. How often do you make careless mistakes when you have to work on a boring or difficult project?							
8. How often do you have difficulty keeping your attention when you are doing boring or repetitive work?							
9. How often do you have difficulty concentrating on what people say to you, even when they are speaking to you directly?							
10. How often do you misplace or have difficulty finding things at home or at work?							
11. How often are you distracted by activity or noise around you?							
12. How often do you leave your seat in meetings or other situations in which you are expected to remain seated?							
13. How often do you feel restless or fidgety?							
14. How often do you have difficulty unwinding and relaxing when you have time to yourself?							
15. How often do you find yourself talking too much when you are in social situations?							
16. When you're in a conversation, how often do you find yourself finishing the sentences of the people you are talking to, before they can finish them themselves?							
17. How often do you have difficulty waiting your turn in situations when turn taking is required?							
18. How often do you interrupt others when they are busy?							
							Part B

Depression Anxiety Stress Scale (DASS)

Please read each statement and circle a number 0, 1, 2 or 3, which indicates how much the statement applied to you over the past week. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:
0 Did not apply to me at all
1 Applied to me to some degree, or some of the time
2 Applied to me to a considerable degree, or a good part of time
3 Applied to me very much, or most of the time

1. I found myself getting upset by quite trivial things	0	1	2	3
2. I was aware of dryness of my mouth	0	1	2	3
3. I couldn't seem to experience any positive feeling at all	0	1	2	3
4. I experienced breathing difficulty (e.g., excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3
5. I just couldn't seem to get going	0	1	2	3
6. I tended to over-react to situations	0	1	2	3
7. I had a feeling of shakiness (e. g., legs going to give way)	0	1	2	3
8. I found it difficult to relax	0	1	2	3
9. I found myself in situations that made me so anxious I was most relieved when they ended	0	1	2	3
10. I felt that I had nothing to look forward to	0	1	2	3
11. I found myself getting upset rather easily	0	1	2	3
12. I felt that I was using a lot of nervous energy	0	1	2	3
13. I felt sad and depressed	0	1	2	3
14.I found myself getting impatient when I was delayed in any way (e.g., lifts, traffic lights, being kept waiting)	0	1	2	3
15. I had a feeling of faintness	0	1	2	3
16. I felt that I had lost interest in just about everything	0	1	2	3
17. I felt I wasn't worth much as a person	0	1	2	3
18. I felt that I was rather touchy	0	1	2	3

19. I perspired noticeably (e.g., hands sweaty) in the absence of high temperatures or physical exertion	0	1	2	3
20. I felt scared without any good reason	0	1	2	3
21. I felt that life wasn't worthwhile	0	1	2	3
22. I found it hard to wind down	0	1	2	3
23. I had difficulty in swallowing	0	1	2	3
24. I couldn't seem to get any enjoyment out of the things I did	0	1	2	3
25. I was aware of the action of my heart in the absence of physical exertion (e.g., sense of heart rate increase, heart missing a beat)	0	1	2	3
26. I felt down-hearted and blue	0	1	2	3
27. I found that I was very irritable	0	1	2	3
28. I felt I was close to panic	0	1	2	3
29. I found it hard to calm down after something upset me	0	1	2	3
30. I feared that I would be "thrown" by some trivial but unfamiliar task	0	1	2	3
31.I was unable to become enthusiastic about anything	0	1	2	3
32. I found it difficult to tolerate interruptions to what I was doing	0	1	2	3
33. I was in a state of nervous tension	0	1	2	3
34. I felt I was pretty worthless	0	1	2	3
35. I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
36. I felt terrified	0	1	2	3
37. I could see nothing in the future to be hopeful about	0	1	2	3
38. I felt that life was meaningless	0	1	2	3
39. I found myself getting agitated	0	1	2	3
40. I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
41. I experienced trembling (e.g., in the hands)	0	1	2	3
42. I found it difficult to work up the initiative to do things	0	1	2	3

Learning and Study Strategy Inventory (LASSI)

Very much typical of me
Fairly typical of me
Somewhat typical of me
Not very typical of me
Not at all typical of me

1.	I concentrate fully when studying.	a b c d e
2.	I am unable to summarize what I have just heard in a lecture or read in a textbook.	a b c d e
3.	I try to find relationships between what I am learning and what I already know.	a b c d e
4.	I find it hard to stick to a study schedule.	a b c d e
5.	In taking tests, writing papers, etc., I find I have misunderstood what was wanted and lose points because of it.	a b c d e
6.	I am able to study subjects I do not find interesting.	a b c d e
7.	When I decide to study, I set aside a specific length of time and stick to it.	a b c d e
8.	Because I don't listen carefully, I don't understand some course material.	a b c d e
9.	I try to identify potential test questions when reviewing my class material.	a b c d e
10.	During class discussions, I have trouble figuring out what is important enough to put in my notes.	a b c d e
11.	To help me remember new principles we are learning in class, I practice applying them.	a b c d e
12.	My underlining is helpful when I review text material.	a b c d e
13.	When it comes to studying, procrastination is a problem for me.	a b c d e
14.	I set high standards for myself in school.	a b c d e
15.	When I am studying a topic, I try to make everything fit together logically.	a b c d e
16.	I find it difficult to maintain my concentration while doing my coursework.	a b c d e
17.	I only study the subjects I like.	a b c d e
18.	When preparing for an exam, I create questions that I think might be included.	a b c d e
19.	When I take a test, I realize I have studied the wrong material.	a b c d e
20.	If there is a web site for my textbook, I use the information provided there to help me learn the material.	a b c d e
21.	I have difficulty identifying the important points in my reading.	a b c d e
22.	When work is difficult, I either give up or study only the easy parts.	a b c d e
23.	To help me learn the material presented in my classes, I relate it to my own general knowledge.	a b c d e
24.	There are so many details in my textbooks that it is difficult for me to find the main ideas.	a b c d e
25.	I review my notes before the next class.	a b c d e
26.	I have difficulty adapting my studying to different types of courses.	a b c d e
27.	I translate what I am studying into my own words.	a b c d e

Very much typical of me
Fairly typical of me
Somewhat typical of me
Not very typical of me
Not at all typical of me

28.	I put off studying more than I should.	a	b	c	d	e
29.	I get discouraged because of low grades.	a	b	c	d	e
30.	Even if I am having difficulty in a course, I can motivate myself to complete the work.	a	b	c	d	e
31.	I spread out my study times so I do not have to "cram" for a test.	a	b	c	d	e
32.	My mind wanders a lot when I study.	a	b	c	d	e
33.	I stop periodically while reading and mentally go over or review what was said.	a	b	c	d	e
34.	I go to the college learning center for help when I am having difficulty learning the material in a course.	a	b	c	d	e
35.	I feel very panicky when I take an important test.	a	b	c	d	e
36.	I have a positive attitude about attending my classes.	a	b	c	d	e
37.	I test myself to see if I understand what I am studying.	a	b	c	d	e
38.	When I study for a test, I have trouble figuring out just what to do to learn the material.	a	b	c	d	e
39.	Even if I do not like an assignment, I am able to get myself to work on it.	a	b	c	d	e
40.	When they are available, I attend review sessions for my classes.	a	b	c	d	e
41.	I would rather not be in school.	a	b	c	d	e
42.	I set goals for the grades I want to get in my classes.	a	b	c	d	e
43.	When I am taking a test, worrying about doing poorly interferes with my concentration.	a	b	c	d	e
44.	I try to see how what I am studying would apply to my everyday life.	a	b	c	d	e
45.	I have trouble understanding exactly what a test question is asking.	a	b	c	d	e
46.	I worry that I will flunk out of school.	a	b	c	d	e
47.	To help make sure I understand the material, I review my notes before the next class.	a	b	c	d	e
48.	I do not care about getting a general education, I just want to get a good job.	a	b	c	d	e
49.	I find it hard to pay attention during lectures.	a	b	c	d	e
50.	I try to relate what I am studying to my own experiences.	a	b	c	d	e
51.	I dislike most of the work in my classes.	a	b	c	d	e
52.	I review my answers during essay tests to make sure I have made and supported my main points.	a	b	c	d	e
53.	When studying, I seem to get lost in the details and miss the important information.	a	b	c	d	e
54.	I use special study helps, such as italics and headings, that are in my textbook.	a	b	c	d	e

Very much typical of me
Fairly typical of me
Somewhat typical of me
Not very typical of me
Not at all typical of me

55.	I am very easily distracted from my studies.	a	b	c	d	e
56.	Even when I don't like a course, I work hard to get a good grade.	a	b	c	d	e
57.	It is hard for me to decide what is important to underline in a text.	a	b	c	d	e
58.	To help me learn the material, I complete at least some of the practice problems in my textbooks.	a	b	c	d	e
59.	I do not have enough time to study because I spend too much time with my friends.	a	b	c	d	e
60.	To check my understanding of the material in a course, I make up possible test questions and try to answer them.	a	b	c	d	e
61.	Even when I am well prepared for a test, I feel very anxious.	a	b	c	d	e
62.	I set aside more time to study the subjects that are difficult for me.	a	b	c	d	e
63.	I do poorly on tests because I find it hard to plan my work within a short period of time.	a	b	c	d	e
64.	During a demonstration in class, I can identify the important information I need to remember.	a	b	c	d	e
65.	I am up-to-date in my class assignments.	a	b	c	d	e
66.	When I am having trouble with my coursework, I do not go to the instructor for help.	a	b	c	d	e
67.	I end up "cramming" for every test.	a	b	c	d	e
68.	When I listen to class lectures, I am able to pick out the important information.	a	b	c	d	e
69.	When I am studying, worrying about doing poorly in a course interferes with my concentration.	a	b	c	d	e
70.	I do not care if I finish college as long as I have a good time.	a	b	c	d	e
71.	I try to find a study partner or study group for each of my classes.	a	b	c	d	e
72.	Courses in certain subjects, such as math, science, or a foreign language, make me anxious.	a	b	c	d	e
73.	When completing a problem-solving task, it is difficult for me to pick out the important information.	a	b	c	d	e
74.	After a class, I review my notes to help me understand the information that was presented.	a	b	c	d	e
75.	If I get distracted during class, I am able to refocus my attention.	a	b	c	d	e
76.	In my opinion, what is taught in my courses is not worth learning.	a	b	c	d	e
77.	If I am having trouble studying, I ask another student or the instructor for help.	a	b	c	d	e
78.	I get so nervous and confused when taking an examination that I fail to answer questions to the best of my ability.	a	b	c	d	e
79.	I find that during lectures I think of other things and don't really listen to what is being said.	a	b	c	d	e
80.	Even when study materials are dull and uninteresting, I manage to keep working until I finish.	a	b	c	d	e

You have now completed **LASSI**. Turn the page to begin the scoring

Barkley's Deficits of Executive Functioning Scale- Long Form (BDEFS-LF)—Self-Report

Name_____
Date_____
Sex: (Circle One) Male Female Age:_____

Instructions
How often do you experience each of these problems? Please circle the number next to each item that best describes your behavior **DURING THE PAST 6 MONTHS.** Please ignore the sections marked "For Office Use Only."

Section 1 Items:	Never or Rarely	Some-times	Often	Very Often
1. Procrastinate or put off doing things until the last minute	1	2	3	4
2. Poor sense of time	1	2	3	4
3. Waste or mismanage my time	1	2	3	4
4. Not prepared on time for work or assigned tasks	1	2	3	4
5. Fail to meet deadlines for assignments	1	2	3	4
6. Have trouble planning ahead or preparing for upcoming events	1	2	3	4
7. Forget to do things I am supposed to do	1	2	3	4
8. Can't seem to accomplish the goals I set for myself	1	2	3	4
9. Late for work or scheduled appointments	1	2	3	4
10. Can't seem to hold in mind things I need to remember to do	1	2	3	4
11. Can't seem to get things done unless there is an immediate deadline	1	2	3	4
12. Have difficulty judging how much time it will take to do something or get somewhere	1	2	3	4
13. Have trouble motivating myself to start work	1	2	3	4
14. Have difficulty motivating myself to stick with				

137

my work and get it done	1	2	3	4
15. Not motivated to prepare in advance for things I know I am supposed to do	1	2	3	4
16. Have trouble completing one activity before starting into a new one	1	2	3	4
17. Have trouble doing what I tell myself to do	1	2	3	4
18. Difficulties following through on promises or commitments I may make to others	1	2	3	4
19. Lack self-discipline	1	2	3	4
20. Have difficulty arranging or doing my work by its priority or importance; can't "prioritize" well	1	2	3	4
21. Find it hard to get started or get going on things I need to get done	1	2	3	4
Office Use Only – Section 1 Total Score_____				
Section 2 Items:	Never or Rarely	Some-times	Often	Very Often
22. I do not seem to anticipate the future as much or as well as others	1	2	3	4
23. Can't seem to remember what I previously heard or read about	1	2	3	4
24. I have trouble organizing my thoughts	1	2	3	4
25. When I am shown something complicated to do, I cannot keep the information in mind so as to imitate or do it correctly	1	2	3	4
26. I have trouble considering various options for doing things and weighing their consequences	1	2	3	4
27. Have difficulties saying what I want to say	1	2	3	4
28. Unable to come up with or invent as many solutions to problems as others seem to do	1	2	3	4
29. Find myself at a loss for words when I want to explain something to others	1	2	3	4
30. Have trouble putting my thoughts down in writing as well or as quickly as others	1	2	3	4
31. Feel I am not as creative or inventive as others of my level of intelligence	1	2	3	4
32. In trying to accomplish goals or assignments, I find I am not able to think of as many ways of doing things as others	1	2	3	4

33. Have trouble learning new or complex activities as well as others	1	2	3	4
34. Have difficulty explaining things in their proper order or sequence	1	2	3	4
35. Can't seem to get to the point of my explanations as quickly as others	1	2	3	4
36. Have trouble doing things in their proper order or sequence	1	2	3	4
37. Unable to "think on my feet" or respond as effectively as others to unexpected events	1	2	3	4
38. I am slower than others at solving problems I encounter in my daily life	1	2	3	4
39. Easily distracted by irrelevant events or thoughts when I must concentrate on something	1	2	3	4
40. Not able to comprehend what I read as well as I should be able to do; have to re-read material to get its meaning	1	2	3	4
41. Cannot focus my attention on tasks or work as well as others	1	2	3	4
42. Easily confused	1	2	3	4
43. Can't seem to sustain my concentration on reading, paperwork, lectures, or work	1	2	3	4
44. Find it hard to focus on what is important from what is not important when I do things	1	2	3	4
45. I don't seem to process information as quickly or as accurately as others	1	2	3	4
Office Use Only – Section 2 Total Score _____				
Section 3 Items:	Never or Rarely	Some-times	Often	Very Often
46. Find it difficult to tolerate waiting; impatient	1	2	3	4
47. Make decisions impulsively	1	2	3	4
48. Unable to inhibit my reactions or responses to events or others	1	2	3	4
49. Have difficulty stopping my activities or behavior when I should do so	1	2	3	4
50. Have difficulty changing my behavior when I am given feedback about my mistakes	1	2	3	4
51. Make impulsive comments to others	1	2	3	4

52. Likely to do things without considering the consequences for doing them	1	2	3	4
53. Change my plans at the last minute on a whim or last minute impulse	1	2	3	4
54. Fail to consider past relevant events or past personal experiences before responding to situations (I act without thinking)	1	2	3	4
55. Not aware of things I say or do	1	2	3	4
56. Have difficulty being objective about things that affect me	1	2	3	4
57. Find it hard to take other people's perspectives about a problem or situation	1	2	3	4
58. Don't think about or talk things over with myself before doing something	1	2	3	4
59. Trouble following the rules in a situation	1	2	3	4
60. More likely to drive a motor vehicle much faster than others (Excessive speeding)	1	2	3	4
61. Have a low tolerance for frustrating situations	1	2	3	4
62. Cannot inhibit my emotions as well as others	1	2	3	4
63. I don't look ahead and think about what the future outcomes will be before I do something (I don't use my foresight)	1	2	3	4
64. I engage in risk taking activities more than others are likely to do	1	2	3	4
Office Use Only – Section 3 Total Score_____				
Section 4 Items:	Never or Rarely	Some-times	Often	Very Often
65. Likely to take short cuts in my work and not do all that I am supposed to do	1	2	3	4
66. Likely to skip out on work early if my work is boring to do	1	2	3	4
67. Do not put as much effort into my work as I should or than others are able to do	1	2	3	4
68. Others tell me I am lazy or unmotivated	1	2	3	4
69. Have to depend on others to help me get my work done	1	2	3	4
70. Things must have an immediate payoff for me				

or I do not seem to get them done	1	2	3	4
71. Have difficulty resisting the urge to do something fun or more interesting when I am supposed to be working	1	2	3	4
72. Inconsistent in the quality or quantity of my work performance	1	2	3	4
73. Unable to work as well as others without supervision or frequent instruction	1	2	3	4
74. I do not have the willpower or determination that others seem to have	1	2	3	4
75. I am not able to work toward longer term or delayed rewards as well as others	1	2	3	4
76. I cannot resist doing things that produce immediate rewards even if they are not good for me in the long run	1	2	3	4
Office Use Only – Section 4 Total Score				

Section 5 Items:	Never or Rarely	Some-times	Often	Very Often
77. Quick to get angry or become upset	1	2	3	4
78. Over-react emotionally	1	2	3	4
79. Easily excitable	1	2	3	4
80. Unable to inhibit showing strong negative or positive emotions	1	2	3	4
81. Have trouble calming myself down once I am emotionally upset	1	2	3	4
82. Cannot seem to regain emotional control and become more reasonable once I am emotional	1	2	3	4
83. Cannot seem to distract myself away from whatever is upsetting me emotionally to help calm me down. I can't refocus my mind to a more positive framework.	1	2	3	4
84. Unable to manage my emotions in order to accomplish my goals successfully or get along well with others	1	2	3	4
85. I remain emotional or upset longer than others	1	2	3	4
86. I find it difficult to walk away from emotionally				

upsetting encounters with others or leave situations in which I have become very emotional	1	2	3	4
87. I cannot re-channel or redirect my emotions into more positive ways or outlets when I get upset	1	2	3	4
88. It am not able to evaluate an emotionally upsetting event more objectively	1	2	3	4
89. I cannot redefine negative events into more positive viewpoints when I feel strong emotions	1	2	3	4
Office Use Only – **Section 5** Total Score				
Office Use Only **Total of Sections 1-5** Total EF Summary Score				
Office Use Only **Add Items 1, 6, 14, 16, 24, 49, 50, 55, 60, 65 & 69** ADHD-EF Index Score				

Mind Wandering Task (MWT)

What are you thinking about right now? Please indicate your answer by placing Y for 'yes' in the corresponding column. Once you are finished please pull a line across the columns as per the example.

Focused on the story	**Thinking about other things**
Y	

Mind Wandering Task 2 (MWT2; Baseline-Assessment)

1. According to Leo, who will be the last person to see him alive?

   _____

2. What type of shoes did Leo try on?

   _____

3. What did the women say when Leo called to apply for the modeling position?

   _____

4. What illness did Leo's uncle die from?

   _____

5. When did Leo and Bruno originally meet?

   _____

6. Why did Bruno move into the Leo's building?

   _____

7. What type of glasses was Bruno wearing?

   _____

Mind Wandering Task (MWT2; Post-study assessment)

1. How many locksmiths did the men contact before reaching Leo?

   _____

2. What did Leo find in a box when he was looking for his tools?

   _____

3. What happened to Bruno's note?

   _____

4. What did Leo fill his pockets with while sitting in the limousine?

   _____

5. Why did Leo go into the botanical garden?

   _____

6. How did Leo pay for his taxi fare?

   _____

7. Why did Leo get audio books for Bruno?

   _____

Extracurricular Activity Checklist (EAC)

Please indicate if, during the last six weeks, you have begun any of the following activities:

Item	**Yes (√)**	**No (√)**	**Frequency (#)**
Meditation	_____	_____	_____
Yoga	_____	_____	_____
Exercise	_____	_____	_____
Tutoring	_____	_____	_____
Study group(s)	_____	_____	_____
Asked for help from professor	_____	_____	_____
Asked for help from TA	_____	_____	_____
Started seeing a counsellor	_____	_____	_____
Any formal stress reduction practice	_____	_____	_____

Appendix C: Mindfulness for Academic Success (MAS) Program Outline

Session 1: Disengaging the Automatic Pilot

Theme: Mindfulness starts when we recognize the tendency to be on automatic pilot and make a commitment to learning how best to step out of it to become aware of each moment. Practice in purposely moving attention around the body shows both how simple and difficult this can be (Segal, Williams, & Teasdale, 2002).

Agenda (90 minutes)	**Time (minutes)**
1. Introductions, confidentiality (MBSR/MBCT)	15
- Discuss commitment to practice (MBSR/MBCT)	5
2. Raisin exercise (MBSR/MBCT)	15
- Feedback and discussion	10
3. Introduction to mindfulness (based on literature from MBSR/MBCT)	10
4. The seven right attitudes (MBSR)	10
5. Three-minute breathing space (MBSR/MBCT)	5
- Feedback and discussion of homework	10
6. Demo Facebook group, accessing files, filling out questionnaires, and recording homework on www.thepresentmoment.ca website	10
7. Instructions e-mailed and posted on Facebook group	

Homework (recorded electronically on the MAS website)

1. Three-minute practice before each class, doing homework or writing exam
2. Practice informal mindfulness in routine activities: washing dishes, shopping, eating, brushing teeth, etc.
3. Eat one meal mindfully

Information in binder (MBCT/MBSR)

- Disengaging the automatic pilot
- Definition of mindfulness and the seven right attitudes
- The three-minute breathing space—basic instructions

Downloadable audio files (recoded for this study)

- Three-minute breathing space

Session 2: Thought and Feelings

Theme: Further focus on the body begins to show more clearly the chatter of the mind and how it tends to control our reactions to everyday events (Segal, Williams, & Teasdale, 2002).

Agenda (90 minutes)	**Time (minutes)**
1. Body scan (MBSR/MBCT)	20
- Feedback and discussion	10
2. Homework discussion (MBSR/MBCT)	15
- Experience with three-minute breathing space, informal mindful routine activity, and eating a meal mindfully	
3. Thoughts and feelings exercise (MBCT)	15
4. Discussion about attribution/explanatory style	15
5. Three-minute breathing space (MBSR/MBCT)	5
6. Homework assignment	10
- Sign up for homework reminder	

Homework (recorded electronically on the MAS website)

1. Three-minute practice before each class, doing homework or writing exam
2. Pleasant Events Calendar—write about one event each day
3. Body scan 6 days (10 minutes)

Corresponding information in the binder (MBCT)

- Tips for the body scan

Downloadable audio files (recoded for this study)

- Body scan

Session 3: Barriers to Practice

Theme: With a greater awareness of how the mind can often be busy and scattered, learning to take awareness intentionally to the breath offers the possibility of being more focused and gathered (Segal, Williams, & Teasdale, 2002).

Agenda (90 minutes)	**Time (minutes)**
1. Learning diaphragmatic breathing (MBSR/MBCT) option for 3/7 pursed lips	5
2. Sitting meditation with awareness of breath (MBSR/MBCT)	20
- Feedback (mind wandering, boredom, sleepiness, pain)	10
3. Mind wandering, its effects and the refocusing process	10
4. Homework discussion (MBSR/MBCT)	20
- Attitude toward practice and barriers to practice	
- Practice of three-minute breathing space, routine activities	
- Body scan	
- Pleasant Events Calendar	
5. Seeing exercise (MBSR/MBCT)	10
- Feedback	5
6. Homework assignment	10

Homework (recorded electronically on the MAS website)

1. Three-minute practice before each class, doing homework or writing exam
2. Unpleasant Events Calendar—write about one event each day
3. Mindfulness of breath (15 minutes)

Corresponding information in the binder (MBCT)

- Dealing with barriers
- Mindfulness of the breath
- The breath

Downloadable audio files (recoded for this study)

- Mindful breath

Session 4: Staying Present

Theme: The mind is most scattered when it tries to cling to some things and avoid/escape other things. Mindfulness offers a way of staying present by giving another place from which to view things: to help take a wider perspective and relate differently to experience (Segal, Williams, & Teasdale, 2002).

Agenda (90 minutes)	**Time (minutes)**
1. Hearing exercise (modified from MBCT)	10
- Being present: notice changes in thoughts and feelings with different types of sounds and images	
- Feedback and discussion	5
2. Sitting meditation with awareness of sounds (MBSR/MBCT)	20
- Feedback and discussion	10
3. Homework discussion (MBSR/MBCT)	20
- Practice of three-minute breathing space, routine activities	
- Unpleasant Events Calendar	
- Practice of breath work	
4. Writing assignment (notice all aspects of an object and then write a story as if you were that object)	10
- Feedback and discussion (thoughts, feelings about experience)	
5. Discussion about automatic thoughts, irrational beliefs (MBCT)	10
6. Homework assignment	5

Homework (recorded electronically on the MAS website)

1. Three-minute practice before each class, doing homework or writing exam
2. Seated mindfulness meditation 6 days (15 minutes)

Corresponding information in the binder (MBCT)

- Staying present

Downloadable audio files (recoded for this study)

- Seated mindfulness meditation

Session 5: Allowing/Letting Be

Theme: Relating differently involves bringing to experience a sense of allowing it to be, just as it is without judging it or trying to make it different. Such an attitude of acceptance is a major part of taking care of oneself and seeing more clearly what, if anything, needs to change (Segal, Williams, & Teasdale, 2002).

Agenda (90 minutes)	**Time (minutes)**
1. Sitting meditation with awareness of thoughts (MBSR/MBCT)	25
- Feedback and discussion	10
2. Homework discussion (MBSR/MBCT)	10
- Practice of three-minute breathing space, routine activities	
- Mindfulness meditation	
3. Coping three-minute breathing space (MBSR/MBCT)	5
- Feedback and discussion	10
4. Avoidance worksheet exercise (ACT)	10
5. Discussion about acceptance and letting be (MBSR/MBCT)	10
- Rumi: The Guest House	
- Feedback	5
6. Homework assignment	5

Homework (recorded electronically on the MAS website)

1. Three-minute practice before each class, doing homework or writing exam
7. Coping three-minute practice any time needed
8. Seated mindfulness meditation 6 days (15 minutes)

Corresponding information in the binder (MBCT)

- Allowing/letting be
- Using the breathing space—extended instructions

Downloadable audio files (recoded for this study)

- Coping three minute breathing space

Session 6: Thoughts are Not Facts/Maintaining Balance

Theme: Negative moods and the thoughts that accompany them restrict our ability to relate differently to experiences. It is liberating to realize that our thoughts are merely thoughts, even the ones that say they are not (Segal, Williams, & Teasdale, 2002).
Maintaining balance in life is helped by regular mindfulness practice. Good intentions can be strengthened by linking such intentions to a positive reason for taking care of oneself (Segal, Williams, & Teasdale, 2002).

Agenda (90 minutes)	**Time (minutes)**
1. Sitting meditation with awareness of thoughts (MBSR/MBCT)	25
- Feedback and discussion	10
2. Homework discussion (MBSR/MBCT)	15
- Practice of three-minute breathing space, routine activities	
- Coping three-minute breathing space	
- Mindfulness meditation	
3. Moods, thoughts and alternative viewpoints exercise (MBCT)	20
4. Developing own practice, maintaining balance (MBSR/MBCT)	10
5. Read Rumi's poem *Come, come again* (MBSR/MBCT)	5
6. Final remarks	5

Homework (recorded electronically on the MAS website)
1. Three-minute practice before each class, doing homework or writing exam
2. Coping three-minute practice any time needed
3. Seated mindfulness meditation 6 days (15 minutes)

Corresponding information in the binder (MBCT)
- Thoughts are not facts
- Ways you can see your thoughts differently
- When you become aware of negative thoughts
- Relating to thoughts
- Daily mindfulness
- *Come, come again*
- Resource list

Appendix D: Mind Wandering Task Text

Baseline-Assessment Text (pp. 3-6)

When they write my obituary. Tomorrow. Or the next day. It will say, *LEO GURSKY IS SURVIVED BY AN APARTMENT FULL OF STUFF,* I'm surprised I haven't been buried alive. The place isn't big. I have to struggle to keep a path clear between bed and toilet, toilet and kitchen table, kitchen table and front door. If I want to get from the toilet to the front door, impossible, I have to go by way of the kitchen table. I like to imagine the bed as home plate, the toilet as first, the kitchen table as second, the front door as third: should the doorbell ring while I am lying in bed, I have to round the toilet and the kitchen table in order to arrive at the door. If it happens to be Bruno, I let him in without a word and then jog back to bed, the roar of the invisible crowd ringing in my ears.

I often wonder who will be the last person to see me alive. If I had to bet, I'd bet on the delivery boy from the Chinese take-out. **[Time probe 1]** I order in four nights out of seven. Whenever he comes I make a big production of finding my wallet. He stands in the door holding the greasy bag while I wonder if this is the night I'll finish off my spring roll, climb into bed, and have a heart attack in my sleep.

I try to make a point of being seen. Sometimes when I'm out, I'll buy a juice even though I'm not thirsty. If the store is crowded I'll even go so far as dropping my change all over the floor, the nickels and dimes skidding in every direction. I'll get down on my knees. It's a big effort for me to get down on my knees, and an even bigger effort to get up. And yet. Maybe I look like a fool. I'll go into the Athlete's Foot and say, *What do you have in sneakers?* The clerk will look me over like the poor schmuck that I am and direct me over to the one pair of Rockports they carry, something in spanking white. *Nah*, I'll say, I have those already. **[Time probe 2]** Then I'll make my way over to the Reeboks and pick out something that doesn't even resemble a shoe, a waterproof bootie, maybe, and ask for it in size 9. The kid will look again, more carefully. He'll look at me long and hard. *Size 9,* I'll repeat while I clutch the webbed shoe. He'll shake his head and go to the back for them, and by the time he returns I'm peeling off my socks. I'll roll my pants legs up and look down at those decrepit things, my feet, and an awkward minute will pass until it becomes clear that I'm waiting for him to slip the booties onto them. I never actually buy. All I want is not to die on a day when I went unseen.

A few months ago I saw an ad in the paper. It said, *NEEDED: MODELS FOR DRAWING CLASS. $I5/HOUR*. It seemed too good to be me. To have so much looked at. By so many. I called the number. A woman told me to come the following Tuesday. I tried to describe myself, but she wasn't interested. *Anything will do*, she said. **[Time probe 3]**

The days passed slowly. I told Bruno about it, but he misunderstood and thought I was signing up for a drawing class.

After Mrs. Freid on the fourth floor died, and it took three days before anyone found her, Bruno and I got into the habit of checking on each other. We'd make little excuses—*I ran out of toilet paper*, I'd say when Bruno opened the door. A day would pass. There would be a knock on my door. *I lost my TV Guide*, he'd explain, and I'd go and find him mine, even though I knew his was right there where it always was on his couch. Once he came down on a Sunday afternoon. *I need a cup of flour*, he said. It was clumsy, but I couldn't help myself. *You don't know how to cook*.

There was a moment of silence. Bruno looked me in the eye. *What do you know*, he said, *I'm baking a cake*.

When I came to America I knew hardly anyone, only a second cousin who was a locksmith, so I worked for him. If he had been a shoemaker I would have become a shoemaker. But. He was a locksmith. He taught me the trade, and that's what I became. We had a little business together, and then one year he got TB and died, so I took it over. **[Time probe 4]** I sent his wife half the profits, even after she got married to a doctor and moved to Bay Side. I stayed in the business for over fifty years. It's not what I would have imagined for myself. And yet. The truth is I came to like it. I helped those in who were locked out, others I helped keep out what couldn't be let in, so that they could sleep without nightmares.

Then one day I was looking out the window. Maybe I was contemplating the sky. Put even a fool in front of the window and you'll get a Spinoza. The afternoon passed, darkness sifted down. I reached for the chain on the bulb and suddenly it was as if an elephant had stepped on my heart. I fell to my knees. I thought: I didn't live forever. A minute passed. Another minute. Another. I clawed at the floor, pulling myself along toward the phone.

Twenty-five percent of my heart muscle died. It took time to recover and I never went back to work. A year went by. I was aware of time passing for the sake of itself. I stared out the window. I watched fall turn into winter. Winter into spring. Some days Bruno came downstairs to sit with me. We've known each other since we were boys; we went to school together. **[Time probe 5]** He was one of my closest friends, with thick glasses, reddish hair that he hated, and a voice that cracked when he was emotional. I didn't know he was still alive and then one day I was walking down East Broadway and I heard his voice. I turned around. His back was to me, he was standing in front of the grocer's asking for the price of some fruit. I thought: You're hearing things, you're such a dreamer, what is the likelihood—your boyhood friend? I stood frozen on the sidewalk. He's in the ground, I told myself. Here you are in the United States of America, there's McDonald's, get a grip. I waited just to make sure. I wouldn't have recognized his face. But. The way he walked was unmistakable. He was about to pass me, I put my arm out. I didn't know what I was doing, maybe I was seeing things, I grabbed his sleeve. *Bruno*, I said. He stopped and turned. At first he seemed scared and then confused. *Bruno*. He looked at me, his eyes began to fill with tears. I grabbed his other hand, I had one sleeve and one hand. *Bruno*. He started to shake. He touched his hand to my cheek. We were in the middle of the sidewalk, people were hurrying past, it was a warm day in June. His hair was thin and white. He dropped the fruit. *Bruno*.

A couple of years later his wife died. It was too much to live in the apartment without her, everything reminded him, so when an apartment opened up in the floor above me he moved in. **[Time probe 6]** We often sit together at my kitchen table. The whole afternoon might go by without our saying a word. If we do talk, we never speak in Yiddish. The words of our childhood became strangers to us-we couldn't use them in the same way and so we chose not to use them at all. Life demanded a new language.

Bruno, my old faithful. I haven't sufficiently described him. Is it enough to say he is indescribable? No. Better to try and fail than not to try at all. The soft down of your white hair lightly playing about your scalp like a half-blown dandelion. Many times, Bruno, I have been tempted to blow on your head and make a wish. Only a last scrap of decorum keeps me from it. Or perhaps I should begin with your height, which is very short. On a good day you barely reach

my chest. Or shall I start with the eyeglasses you fished out of a box and claimed as your own, enormous round things that magnify your eyes so that your permanent response appears to be a 4.5 on the Richter? They're women's glasses, Bruno! I've never had the heart to tell you. **[Time probe 7]** Many times I've tried. And something else. When we were boys you were the greater writer. I had too much pride to tell you then. But. I knew. Believe me when I say, I knew it then as I know it now. It pains me to think how I never told you, and also to think of all you could have been. Forgive me, Bruno. My oldest friend. My best. I haven't done you justice. You have given me such company at the end of my life. You, especially you, who might have found the words for it all.

Post-study assessment Text (pp. 19-23)

I threw off the sheets and stumbled across the floor, banging into a table leg. *HELLO?* I shouted into the phone, but the line was dead. I hung up, went to the kitchen, and took a glass down from the cabinet. The water gurgled in the pipes and splattered out in a burst. I drank some down and then remembered my plant. I've had it for almost ten years. It's barely alive, but it is alive. More brown than green. There are parts that have withered. But still it lives, leaning always to the left. Even when I rotate it so that what faced the sun no longer faces the sun, it stubbornly leans to the left, choosing against physical need in favour of an act of creativity. I poured the rest of my water into its pot. What does it mean, anyway, *to flourish*?

A moment later the phone rang again. *OK, OK,* I said, picking up the receiver. *No need to wake the whole building*. There was silence on the other end. I said: *Bruno?*

Is this Mr. Leopold Gursky?

I assumed it was someone trying to sell me something. They're always calling to sell. Once they said if I sent in a check for $99 I'd be preapproved for a credit card, and I said, *Right, sure, and if I step under a pigeon I'm approved for their droppings*.

But the man said he wasn't trying to sell me anything. He'd locked himself out of his house. He'd called Information for the number of a locksmith. I told him I was retired. The man paused. He seemed unable to believe his bad luck. He'd already called three other people and no one answered. **[Time probe 1]** *It's pouring out here*, he said.

Couldn't you stay somewhere else for the night? In the morning it'll be easy to find a locksmith. They're a dime a dozen.

No, he said.

All right, I mean, if it's too much… he began, then paused, waiting for me to speak up. I didn't. *OK, then*. I could hear the disappointment in his voice. *Sorry to have disturbed you*.

And yet he didn't hang up and neither did I. I was filled with guilt. I thought: What do I need with sleep? There will be time. Tomorrow. Or the next day.

OK, OK, I said, even though I didn't want to say it. I'd have to dig up my tools. I might as well be looking for a needle in a haystack. *Hold on a second, will you—I'm getting a pen*.

He gave me an address all the way uptown. Only after I hung up did I remember I could wait forever before a bus came at that hour. I had the card in the kitchen drawer for Goldstar Car

Service, not that I ever call it. But. You never know. I ordered a car and started digging through the hall closet for my toolbox. Instead, I found the box of old eyeglasses. **[Time probe 2]** Who knows where I got them. Someone probably selling it on the street with some mismatched china and a doll with no head. From time to time I try on a pair. Once I cooked an omelette wearing a pair of ladies' reading glasses. It was a mammoth omelette, it struck fear in my heart just to look at it. I fished around in the box and pulled out a pair. They were square and flesh-colored, with lenses half an inch thick. I slipped them on. The floor dropped from under me, and when I tried to take a step it lurched upwards. I staggered toward the hall mirror. In an effort to gain some focus I zoomed in, but miscalculated and banged into the glass. The buzzer rang. *I'll be down in a minute*, I shouted into the speaker. When I took off the glasses, the toolbox was there under my nose. I ran my hand across its battered top. Then I grabbed my raincoat off the floor, smoothed down my hair in the mirror, and went out. Bruno's note was still taped to the door. I crumpled it into my pocket. **[Time probe 3]**

A black limousine idled in the street, rain falling in the headlights. Other than that, there were only a few empty cars parked along the curb. I was about to go back into the building, but the limousine driver rolled down the window and called my name. He wore a purple turban. I walked up' to the window. *There must be a mistake,* I said. *I ordered a car*.

OK, he said.

But this is a limousine, I pointed out.

OK, he repeated, motioning me in.

I can't pay extra.

The turban bobbed. He said: *Get in before you get soaking*.

I ducked inside. There were leather seats, and a pair of crystal liquor bottles along the sideboard. It was bigger than I'd imagined. The soft exotic music coming from up front and the gentle rhythm of the windshield wipers only barely reached me. He pointed the nose of the car into the street and we headed into the night. The traffic lights bled into the puddles. I opened a crystal bottle but it was empty. There was a little jar of peppermints and I filled my pockets. **[Time probe 4]**

I sat up and cleared my throat.

Ladies and gentlemen, I'll do my best to keep this brief, you've all been so patient. The truth is I'm shocked, really, I'm pinching myself. An honour I could have only dreamed of, the Goldstar Lifetime Achievement Award, I'm practically speechless… Has it really been? And yet. Yes. All of the evidence suggests. A lifetime.

We made our way through the city. I've walked through all of those neighbourhoods, my business took me all over the city. They even knew me in Brooklyn, I went everywhere. Picking locks for everybody. Sometimes I even walked for pleasure, a whole Sunday I might have spent just walking. Once, years ago, I found myself in front of the Botanical Garden and went in to see the cherry trees. **[Time probe 5]** I bought some Cracker Jacks, and watched the fat lazy goldfish swimming in their pool. There was a wedding party taking photographs under a tree, the white blossoms made it look as if it alone had been caught in a snowstorm. I found my way to the tropical greenhouse. It was another world inside, wet and warm. With my finger I wrote on the glass *LEO GURSKY*.

The limousine came to a stop. I put my face up to the window. Which one? The driver pointed to a townhouse. It was beautiful, with steps up to the door and leaves carved in stone. *Seventeen dollars*, the driver said. I felt in my pocket for my wallet. No. Other pocket. Bruno's note but no wallet. Both pockets of the coat, No, No. I must have left it home in the rush. Then I remembered my fee from the art class. I dug past the peppermints, the note, and came up with it. *Sorry*, I said. How embarrassing. *All I have on me is fifteen* .I admit I was reluctant to part with the bills, hard-earned wasn't the word for them but something else, more bittersweet. But after a brief pause the turban bobbed and the money was accepted. **[Time probe 6]**

The man was standing under the doorway. Of course he hadn't expected me in a limousine, and out I'd popped like Mr. Locksmith to the Stars. I was humiliated, I wanted to explain, *Believe me, I'd never mistake my self for anyone special*. But it was pouring still, and I thought he needed me more than he needed any explanation of how I got there. His hair was matted down from the rain. He thanked me three times for coming. *It's nothing*, I said. And yet. I knew I almost hadn't come.

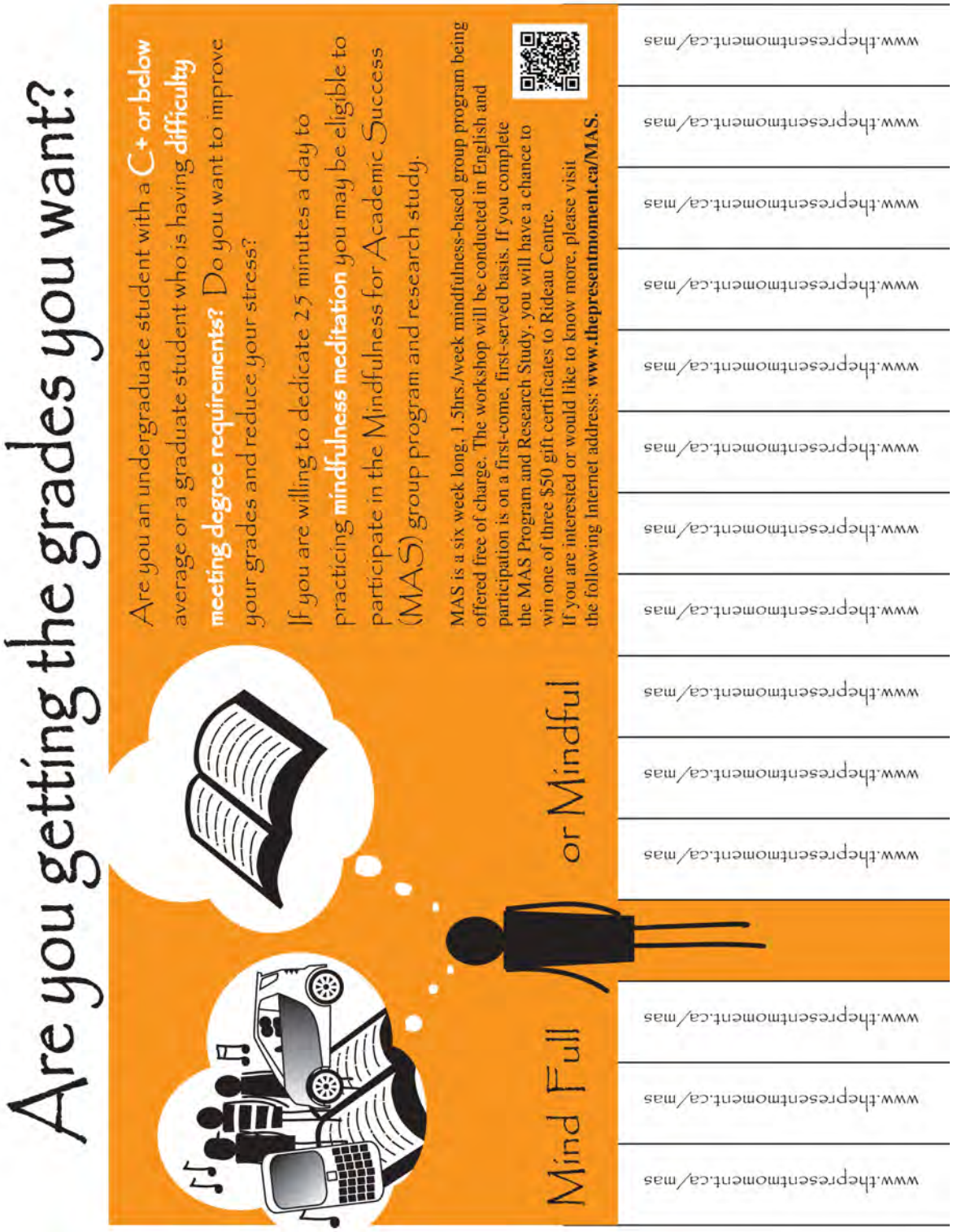
It was a tricky lock. The man stood above me, holding my flashlight. The rain was dripping down the back of my neck. I felt how much depended on my unlocking that lock. The minutes passed. I tried and failed. Tried and failed. And then at last my heart started to race. I turned the handle and the door slipped open.

We stood dripping in the hallway. He took off his shoes, so I took off mine. He thanked me again, and went to change into dry clothes and call me a car. I med to protest, saying I could take the bus or hail a taxi, but he wouldn't hear of it, what with the rain. He left me in the living room. I wandered into the dining room, and from there I caught sight of a roomful of books. I'd never seen so many books in one place that wasn't a library. I walked in.

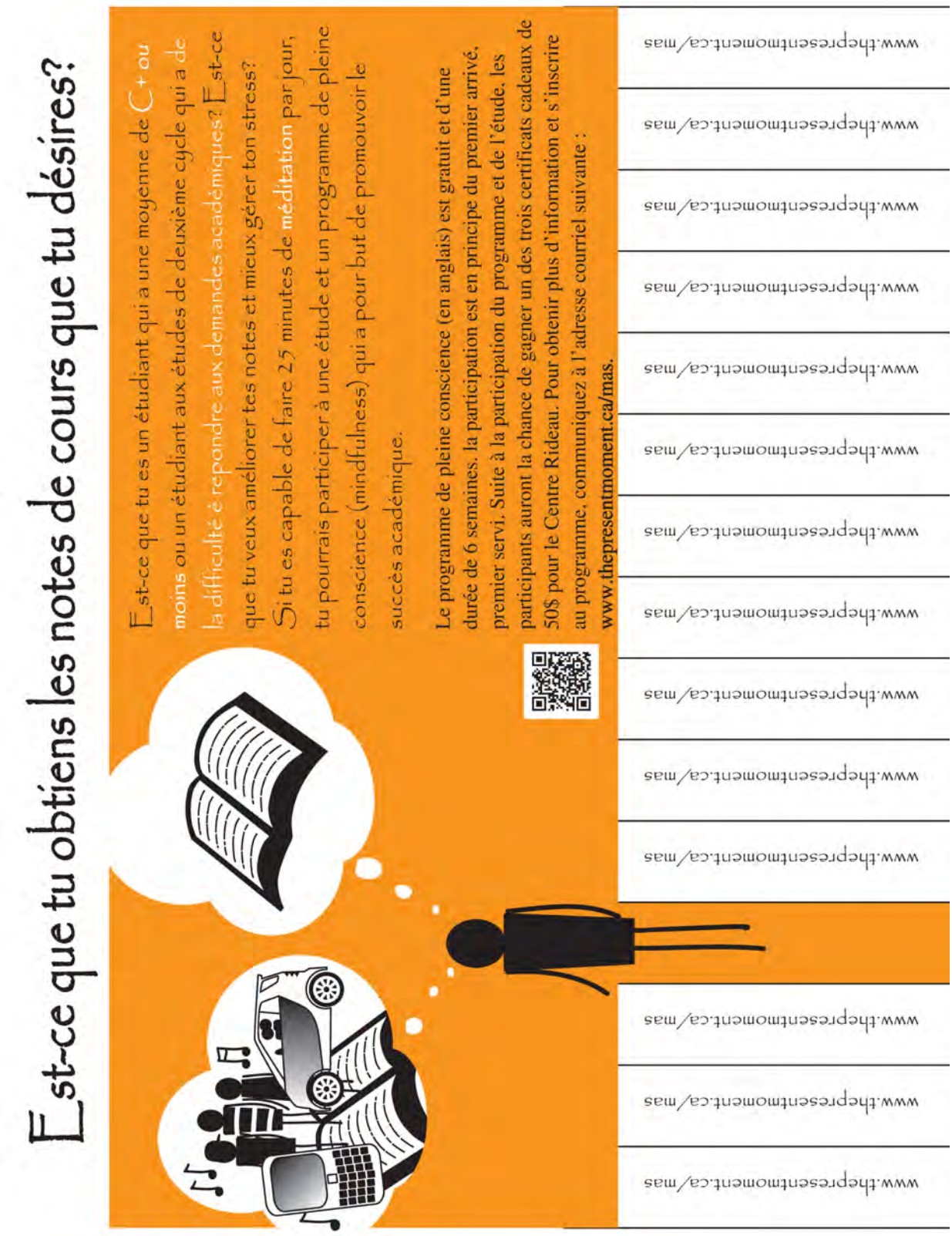
I, too, like to read. Once a month I go to the local branch. For myself I pick a novel and for Bruno with his cataracts a book on tape. **[Time probe 7]** At first he was doubtful. *What am I suppose to do with this?* he said, looking at the box set of Anna Karenina. A day or two later I was going about my business when a voice from above bellowed, ALL HAPPY FAMILIES RESEMBLE ONE ANOTHER, nearly giving me a conniption. After that he listened to whatever I brought him at top volume, then returned it to me without comment. One afternoon I came back from the library with Ulysses. The next morning I was in the bathroom when, STATELY PLUMP BUCK MULLIGAN, rang out from above. For a month straight he listened. He had a habit of pressing the stop button and rewinding when he hadn't fully understood something.

Appendix E: Recruitment Material

English Poster



French Poster



Web Notice, Newsletter and Newspaper Advertisement

Mindfulness for Academic Success (MAS) workshop/research study

Are you an undergraduate student with a C+ or below average, or a graduate student who is having difficulty meeting degree requirements? Do you want to improve your grades and reduce your stress? If you are willing to dedicate 25 minutes a day to practicing mindfulness meditation, you may be eligible to participate in the Mindfulness for Academic Success (MAS) group program and research study. MAS is a 6-week long, 1.5hrs./week mindfulness-based group program being offered free of charge. The workshop will be conducted in English and participation is on a first-come, first-served basis.

If you complete the MAS Program and Research Study, you will have a chance to win one of three $50 cash prizes.

If you are interested or would like to know more, please visit the following Internet address: **www.thepresentmoment.ca/MAS.**

Script for Visiting Learning Support and Health Services

Hi, my name is Zsuzsa Grandpierre and I am MA candidate in the Faculty of Education at University of Ottawa. I am currently conducting research on how to improve academic prefromance. I believe that the practice of mindfulness meditation may help students improve their executive functioning, academic performance and reduce their stress.

I am looking for students who experiencing difficulties with their academic performance and may be interested in participating in this research. I am offering the 6-week long Mindfulness for Academic Success (MAS) program, and in this program students would get together once a week for 1.5 hours to learn different mindfulness techniques. This study is free of charge and will be conducted in English. Participation will be on a first-come, first-served basis.

Can I place this [show poster] recruitment poster in your waiting area?

Thank you,

E-mail to Academic Advisors, Learning Support Workers, and Health Service Providers

Subject: Mindfulness for Academic Success (MAS) Program and Research Study

The mindfulness for academic success (MAS) program and research study is looking for students who are experiencing difficulty with their academic performance. The study investigates the effect of MAS on executive functions (EF), academic performance, and stress. This study is free of charge and will be conducted in English. Participation will be on a first-come, first-served basis.

Mindfulness-based interventions have been shown to be effective in attention training, improving information processing, regulating achievement-oriented behaviours and emotions, and reducing stress. Research not only indicates that mindfulness-based interventions can improve students' EF processes, but it also suggests that students with poor EF processes benefit the most from these interventions.

MAS is a meditation-based group program that incorporates both formal (sitting meditation, body scan) and informal practices, such as paying attention to any daily activity. The program consists of six weekly 1.5-hour group sessions, where participants learn mindfulness techniques and have an opportunity to discuss their experiences. In addition to attending weekly sessions, students are required to complete 25 minutes of daily home practice, which consists of short written assignments and practicing formal and informal mindfulness.

Eligible students must have a C+ or below average if in an undergraduate program, or must experience difficulties meeting degree requirements if in a graduate program, and should be interested in improving their grades and in reducing their stress.

If you would like to get more information about this study please contact me (information below) or visit www.thepresentmoment.ca/MAS.

If you are comfortable with recommending the MAS program and research study, please forward this e-mail to students, or send them directly to www.thepresentmoment.ca/MAS to get more information and/or to register.

Sincerely,

Zsuzsanna Grandpierre, M.A. candidate

University of Ottawa, Faculty of Education, Department of Educational Counselling, 286 Lamoureux Hall (LMX), 145 Jean-Jacques-Lussier Private;

This study has been approved by the University of Ottawa Social Sciences and Humanities Research Ethics Board (06-12-16) and by Carleton University Psychology Research Ethics Board.

Appendix F: Electronic Registration Material

HOME PAGE: Signup Information

Left Side Bar	Main Area
Register **Start date**	**Mindfulness for Academic Success (MAS) Program and Research Study** *Mindfulness means paying attention in a particular way; on purpose, in the present moment, and non-judgmentally*—Kabat-Zinn (1994) The mindfulness for academic success (MAS) program and research study is looking for students who are experiencing difficulty with their academic performance. The study investigates the effect of MAS on executive functions (EF), academic performance, and stress. **Benefits of mindfulness:** the practice of mindfulness has been show to: - Improve the ability to pay attention [1] - Improve information processing and executive functioning (i.e., time management, problem solving [2,3,4] - Enhance response flexibility and strengthen the ability to control thoughts [5] - Regulate achievement-oriented behaviours and emotions [6,7] - Positively influence psychological and physical well-being [8] - Reduce stress [9] Consequently, the practice of mindfulness leads to a more complete experience of the present moment and to the formation of more meaningful cognitive connections. These studies suggest that mindfulness-based interventions may be an effective and integrative approach to improve students' ability to pay better attention, enhance their EF processes, and reduce the negative effects of stress on their academic performance. **Program description**: MAS incorporates both formal (sitting meditation and body scan) and informal practices, such as paying attention to any daily activity. The program consists of six weekly 1.5-hour group sessions, where participants learn mindfulness techniques and have an opportunity to discuss their experiences with mindfulness. Students are also required to complete 25 minutes of daily home practice, which consists of short written assignments and practicing formal and informal mindfulness. Participation in this research study also requires the completion of pre- and post-study assessments (approximately 1 hour each), which includes filling out questionnaires about academic status and performance, mindfulness, and executive functions. All gathered information will be kept confidentially and participation in both the study and the MAS program is voluntary. This study is free of charge and will be conducted in English. Participation will be on a first-come, first-served basis.

	Eligibility: We are looking for students who: 1. have completed their first post-secondary semester; 2. undergraduate students who have a C+ or below overall average, or graduate students who are having difficulty meeting the requirements of their degree program but are interested in improving their grades and in reducing their stress; 3. are committed to come to all sessions and complete their homework; 4. do not suffer from serious mental health disorders; **Cost/Incentive:** The MAS program and all material distributed during the session are free of charge and students are not compensated for participating in the study. However, students who: (1) complete at least 70% of their homework; (2) attend at least 5 sessions; and (3) complete the post-study assessments will have a chance to win one of the three $50.00 gift cards to the Rideau Center. **Questions**: If you have any questions about this study, you can contact Zsuzsanna Grandpierre Thank you for your interest in our research and for your assistance with this project.

Registration

	Registration information: To determine your MAS program/study eligibility you will be asked to fill out two questionnaires after you complete registration. These questionnaires will inquire about your gender, university status and major, previous meditation experience, program commitment levels and mental health. You will be contacted via e-mail to inform you about the status of your registration, and if you are eligible to participate you will be asked to set up an appointment to complete the pre-study assessments. If you are not accepted into the program you will be either contacted by phone or through e-mail and your account will be immediately deleted. **Program date/location:** There is a 50/50 chance that you will either begin the MAS program immediately following the pre-study assessments or six weeks later. You will be notified by e-mail of the starting time and location of the MAS program. By clicking 'I agree', below, you are acknowledging that you have read the registration information, and agree to register in the study and receive emails from the researcher. All of your information will be kept strictly confidentially and at any point during the registration process you have the right to not answer certain

questions or to terminate your registration without suffering any negative consequences. If you are not accepted into the program your information and data will be immediately destroyed.

>> ***I agree*** [click]

Footnotes

4. Jha, A. P., Krompinger, J., & Baime, M. J. (2007). Mindfulness training modifies subsystems of attention. *Cognitive, Affective & Behavioral Neuroscience (Print), 7*(2), 109–119. doi:10.3758/CABN.7.2.109
5. Brefczynski-Lewis, J., Lutz, A., Schaefer, H. S., Levinson, D. B., & Davidson, R. J. (2007). Neural correlates of attentional expertise in long-term meditation practitioners. *Proceedings of the National Academy of Sciences, USA, 104*(27), 11483–11488. doi:10.1073/pnas.0606552104
6. Flook, L., Smalley, S. L., Kitil, M. J., Galla, B. M., Kaiser-Greenland, S., Locke, J., … Kasari, C. (2010). Effects of mindful awareness practices on executive functions in elementary school children. *Journal of Applied School Psychology, 26*(1), 70–95. doi:10.1080/15377900903379125
7. Wells, A. (2002). GAD, Metacognition, and mindfulness: an informational processing analysis. *Clinical Psychology: Science and Practice, 9,* 95–100. doi:10.1093/clipsy.9.1.95
8. Breslin, F. C., Zack, M., & McMain, S. (2002). An information-processing analysis of mindfulness: Implications for relapse prevention in the treatment of substance abuse. *Clinical Psychology: Science and Practice, 9,* 275–299. doi:10.1093/clipsy.9.3.275
9. Howell, A. J., & Buro, K. (2010). Relations among mindfulness, achievement-related self-regulation, and achievement emotions. *Journal of Happiness Studies, 11*(6). doi:10.1007/s10902-010-9241-7
10. Shao, R., & Skarlicki, D. P. (2009). The role of mindfulness in predicting individual performance. *Canadian Journal of Behavioural Science, 41(4),* 195–201. doi:10.1037/a0015166
11. Baer, R. A. (2003). Mindfulness training as a clinical intervention: A conceptual and empirical review. *Clinical Psychology: Science and Practice, 10*(2), 125–143. doi:10.1093/clipsy/bpg015
12. Kabat-Zinn, J. (1990). *Full catastrophe living: The program of the stress reduction clinic at the University of Massachusetts Medical Center*. New York: Dell.

Registration Form

Please provide the following information:

First Name:

Last name:

Name of your school: [pull down menu]

Average GPA**: [pull down menu starting with D- and ending with A+; graduate student who is having difficulty meeting degree requirement]

E-mail address:

Retype e-mail address:

Phone number:

Other contact information:

Password:

Retype password:

To help us get a sense of your availability to attend the MAS program please select one or more of these options: Tuesday 2:30- 4:00 pm ❑; Wednesday 9:30-11:00 am ❑; Wednesday 4:15 to 5:45 ❑;or Friday 2:00-3:30 pm ❑;

	** To be eligible for this study you GPA must be C+ or below if you are an undergraduate student. If you GPA is higher than C+ you are not eligible to participate in this research and the system will not allow you to register. The information you provide here will be kept in strict confidence and if you are not accepted into the program the account you created will be immediately destroyed. >> ***Register*** [click]

Appendix G: Homework Record Forms (www.thepresentmoment.ca/MAS)

Session 1

Please record the number of times you have practiced the **3-minute breathing space** (before class, homework, or exam) each day and make a note of anything that came up during this practice.

Day	**Number of times you have practiced today**	**Comments**

Please record your experience with practicing **informal mindfulness during any routine activity** (washing dishes, shopping, eating, brushing teeth, etc) for every day.

Day	**Routine activity**	**Comments**

Please record your experience with **eating one meal mindfully** during the week.

>> ***Save my changes*** [click]

Session 2

Please record the number of times you have practiced the **3-minute breathing space** (before class, homework, or exam) each day and make a note of anything that came up during this practice.

Day	**Number of times you have practiced today**	**Comments**

You were asked to become aware of one **pleasant event** everyday. We also asked you to notice how it affected your body, mood, feelings, and to take note of any accompanying thoughts during this experience. Please record these in the following chart.

Day	**What was the experience?**	**Were you aware of the pleasant feelings while the event was happening?**	**How did your body feel, in detail, during this experience?**	**What moods, feelings, and thoughts accompanied this event?**	**What thoughts are in your mind now as you write this down?**
1					
2					
3					
4					
5					
6					

Please record the number of times you have practiced the **body scan** and make a note of anything that came up during your practice.

Day	**Practiced Y/N**	**Comments**

>> ***Save my changes*** [click]

Session 3

Please record the number of times you have practiced the **3-minute breathing space** (before class, homework, or exam) each day and make a note of anything that came up during this practice.

Day	**Number of times you have practiced today**	**Comments**

You were asked to become aware of one **unpleasant event** everyday. We also asked you to notice how it affected your body, mood, feelings, and to take note of any accompanying thoughts during this experience. Please record these in the following chart.

Day	**What was the experience?**	**Were you aware of the pleasant feelings while the event was happening?**	**How did your body feel, in detail, during this experience?**	**What moods, feelings, and thoughts accompanied this event?**	**What thoughts are in your mind now as you write this down?**
1					
2					
3					
4					
5					
6					

Please record the number of time you have practiced **mindfulness of breath** during this week. Please also make a note of anything that came up during this practice.

Day	**Practiced mindfulness of breath Y/N**	**Comments**

>> ***Save my changes*** [click]

Session 4

Please record the number of times you have practiced the **3-minute breathing space** (before class, homework, or exam) each day and make a note of anything that came up during this practice.

Day	**Number of times you have practiced today**	**Comments**

Please record the number of times you have practiced **seated mindfulness meditation** and make a note of anything that came up during your practice.

Day	**Practiced Y/N**	**Comments**

>> ***Save my changes*** [click]

Session 5

Please record the number of times you have practiced the **3-minute breathing space** (before class, homework, or exam) each day and make a note of anything that came up during this practice.

Day	**Number of times you have practiced today**	**Comments**

Please record the number of times you have practiced the **3-minute coping breathing** each day and make a note of anything that came up during this practice.

Day	**Number of times you have practiced today**	**Comments**

Please record the number of times you have practiced **seated mindfulness meditation** and make a note of anything that came up during this practice.

Day	**Practiced Y/N**	**Comments**

>> ***Save my changes*** [click]

Session 6

Please record the number of times you have practiced the **3-minute breathing space** (before class, homework, or exam) each day and make a note of anything that came up during this practice.

Day	**Number of times you have practiced today**	**Comments**

Please record the number of times you have practiced the **3-minute copying breathing** each day and make a note of anything that came up during this practice.

Day	**Number of times you have practiced today**	**Comments**

Please record the number of times you have practiced **seated mindfulness meditation** and make a note of anything that came up during this practice.

Day	**Practiced Y/N**	**Comments**

>> ***Save my changes*** [click]

Appendix H: Letters to Participants

Acceptance Letter

Subject: Mindfulness for Academic Success (MAS) Program and Research Study

Dear …,

Thank you for your interest in the MAS program and research study. We appreciate that you took the time to register and fill out the questionnaires. Based on your information I am pleased to inform you that you are eligible to participate in this study.

Please select one of the following three dates to come in to my office at (*university's name and address*) to complete your pre-study assessments and indicate your preference in a returned e-mail:
Day Month, 2012, Hour: Minutes;
Day Month, 2012, Hour: Minutes;
Day Month, 2012, Hour: Minutes.
If none of these dates work for you please call me to set up a time that is more suitable for you.

During this time you will fill out more questionnaires and will have the chance to get more information about the MAS program and our study. You should plan an hour for this visit.

Thank you again,

Rejection Letter

Subject: Mindfulness for Academic Success (MAS) Program and Research Study

Dear …,

Thank you for your interest in the MAS program and research study. We appreciate that you took the time to register and fill out the questionnaires. Based on your information I am sorry to inform you that you are not eligible to participate in this study.

(Next paragraph is dependent on students DIQ. Only one of the following two paragraphs will be included in this letter)
(*Not committed*) Our research results are dependent on students attending most group sessions and completing their 25 minute/day homework. Your answers indicated that at this point you can not make the level of commitment that our research requires.

(*Mental health/DIQ*) You have indicated on our questionnaire that you are currently suffering from (name of disorder). Unfortunately, mindfulness-based interventions are not recommended for people who are experiencing clinical levels of mental health disorders. Therefore, we believe that it would not be in your best interest to participate in our research. We trust that you are under the care of a mental health professional or a physician. In case you are not, or if you are looking for additional support we would like to bring to your attention that (*name of school*) offers health and counselling services at (*address, phone number*).

We regret that we cannot include you in this study and wish you all the best.

Thank you for your interest,

Start Date Letter

Dear ….,

Our random selection process indicated that you will start the MAS program (date, time). The program will take place at (name of university, location, address).

We hope that you will be able to join us and if you have any questions please do not hesitate to contact me.

Thank you again,

Homework Reminder

(*SMS*) This is your daily reminder to complete and log your MAS homework.
Thanks,

(*Facebook*) This is your daily reminder to complete and log your MAS homework.
Thank you,

(*e-mail*) **Subject: MAS homework**

This is your daily remind to complete and log your homework.

Thank you,

Draw Outcome E-mail

Subject: MAS raffle winner

Congratulation, your name has been drawn to receive one of the $50 cash prizes. You can pick up your price at my office [address] on [date and time], but you will have to answer the following skill testing question 15 + 35= ? If this time is not convenient for you please contact me by phone to arrange a better time.

Thank you for your diligent participation in this research,