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The impact of mindfulness education on elementary school students: Evaluation of the *Master Mind* Program

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Abstract

Children need to be equipped with the skills to respond effectively to stress and prevent poor decision-making surrounding alcohol and tobacco use. Training and practice in mindfulness is one possible avenue for building children's skills. Recent research has revealed that mindfulness education in the classroom may play a role in enhancing children's self-regulatory abilities. Thus, the goal of the current study was to extend existing research in mindfulness education in classrooms and conduct an assessment of the feasibility and effectiveness of a new mindfulness education, substance abuse prevention program for 4th and 5th grade children (*Master Mind*). Two elementary schools were randomly assigned to be an intervention group (N = 71) or waitlist control group (N = 40). Students in the intervention group were taught the four-week *Master Mind* program by their regular classroom teachers. At pre- and post-intervention time points, students completed self-reports of their intentions to use substances and an executive functioning performance task. Teachers rated students on their behavior in the classroom. Findings revealed that students who participated in the *Master Mind* program, as compared to those in the wait-list control condition, showed significant improvements in executive functioning skills (girls and boys), as well as a marginally significant increase in self-control abilities (boys only). In addition, significant reductions were found in aggression and social problems (girls and boys), as well as anxiety (girls only). No significant differences across groups were found for intentions to use alcohol or tobacco. Teachers implemented the program with fidelity; both teachers and students positively rated the structure and content of the *Master Mind* program, providing evidence of program satisfaction and feasibility. Although generalization may be limited by the small sample

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size, the findings suggest that mindfulness education may be beneficial in increasing self-regulatory abilities, which is important for substance abuse prevention.

Children need tools to grow and flourish in their everyday lives. Some children lack the skills and resources to effectively deal with obstacles and stressors that might arise in school or with peers, which can take a toll on their physical and mental health (Compas et al., 2001; Twenge, 2000; 2011). Exposure to stress and negative affect can put youth at risk for unhealthy, ineffective coping and decision making regarding substance use (Mason, Hitch, & Spoth, 2009; Skeer, McCormick, Normand, Buka, & Gilman, 2009; Wills, Sandy, Yaegar, Cleary, & Shinar, 2001). Some individuals question the purpose of implementing substance use prevention efforts during childhood citing relatively low prevalence rates; however, children in elementary school have already begun to form their opinions and attitudes about substances (e.g., Freeman, Brucks, & Wallendorft, 2005) and some have even initiated substance use (Kaplow, Curran, Dodge, & CPPRG, 2002; Kupersmidt, Scull, & Austin, 2010). Thus, preventive action is needed in elementary school to equip children with the ability to respond effectively to stress and make healthy decisions to prevent the early onset of alcohol and tobacco use.

Training and practice in mindfulness is gaining popularity in the fields of youth prevention and education as a promising avenue for building self-regulatory skills among children and youth. Mindfulness is conceptualized as being attentive to and aware of what is taking place in the present moment and accepting each moment without judgment (Kabat-Zinn, 1994; 2003). Emerging research in contemplative education has identified a range of benefits for mindfulness training with children and adolescents including increases in attention, behavior and emotion regulation, effective stress responses, and social-emotional competence, as well as decreases in depression, anxiety, and externalizing behaviors (e.g., aggression) (Biegel, Brown, Shapiro, & Schubert, 2009; Broderick & Metz, 2009; Mendelson, Greenberg, Dariotis, Gould, Rhoades, & Leaf, 2010; Napoli, Krech, & Holley, 2005; Saltzman & Goldin, 2008; Schonert-Reichl & Lawlor, 2010). The findings suggest that mindfulness training has the potential to facilitate the healthy development of self-regulation in children (Zelazo & Lyons, 2012). In particular, mindfulness practice provides children with multiple opportunities to become consciously aware of their thoughts and feelings. This awareness may allow youth to thoughtfully respond in situations rather than react impulsively or enact a behavior that could be harmful to themselves such as drinking or smoking. In a recent study with adolescents, negative affect and perceptions of stress were found to mediate the relationship between self-reported mindfulness and cigarette smoking (Black, Milam, Sussman, & Anderson Johnson, 2012a), providing support for the role of mindfulness in substance use in youth.

Despite the many benefits of mindfulness for youth, there are only a few evidenced-based mindfulness programs designed for young children that are currently available. Only one mindfulness education program appears to exist for elementary school students that can be implemented by regular education teachers in the classroom. Students who participated in this mindfulness education program experienced improvements in attention and social-emotional competence, as well as decreases in problem behaviors such as aggression

(Schonert-Reichl & Lawlor, 2010). Currently, there are no mindfulness education programs designed for elementary school children with the goal of preventing substance use.

Thus, the goal of the current study was to evaluate the effectiveness of a new mindfulness education program for late elementary school students, the *Master Mind* program. This program was designed to fill the gap in programs available to provide mindfulness education and substance abuse prevention. The *Master Mind* program was also created to contribute to the growing knowledge base of the effectiveness of mindfulness training delivered by the regular classroom teacher in a classroom setting. The current study was an initial investigation of the *Master Mind* program, which was intended to inform a future longitudinal trial on the efficacy of the *Master Mind* program at preventing substance use.

Intentions and risk of substance use

Elementary school is a time when children are formulating their opinions and attitudes about a number of social and health-related issues. Children as young as six years old possess the ability to evaluate information and attitudes in making a risky choice (e.g., Levin, Hart, Weller, & Harshman, 2007). Children's identification of alcohol and tobacco, as well as intentions to use those substances, develop at a very young age with intentions to use beginning in the 1st grade (Andrews, Tildesley, Hops, Duncan, & Severson, 2003; Andrews, Hampson, & Barckley, 2008; Pasch, Perry, Stigler, & Komro, 2009). The percentage of youth intending to use substances rises each school year with a large increase toward the end of elementary school (Andrews et al., 2003). Although children's attitudes toward drinking and smoking are typically negative in early elementary school (Noel & Thomson, 2012), these attitudes begin to shift to being more positive as children get older (Andrews et al., 2008; Noel & Thomson, 2012; Hampson, Andrews, Barckley, & Severson, 2006). In fact, Miller and colleagues (Miller, Smith, & Goldman, 1990) found that across elementary school, there was an increase in positive expectancies regarding alcohol use, particularly in the third and fourth grades.

In addition, daily stressors can cause disruption in children's lives, potentially draining the resources that children rely on to make healthy choices (Compas et al., 2001; Repetti, McGrath, & Ishikawa, 1999). These stressful events can put youth at risk for actual or future substance use (e.g., King & Chassin, 2008; Skeer, McCormick, Normand, Buka, & Gilman, 2009) as can the inability to effectively cope with the stressors (e.g., Wills, Sandy, Yaeger, Cleary, & Shinar, 2001). By the time children reach the end of elementary school, many believe that smoking can help to decrease stressful and negative feelings (Freeman, Brucks, & Wallendorf, 2005). These beliefs are problematic, particularly if young children decide to utilize these unhealthy strategies for coping with negative experiences. Even more problematic is that early experimentation with substances in elementary school greatly increases the risk of use in middle school (Wilson, Battistich, Syme, & Boyce, 2002). Thus, there is a need for school-based prevention programs that will provide children with skills and resources to effectively manage everyday demands and foster the growth of self-regulatory abilities and healthy decision-making in elementary school.

Self-regulatory abilities

Self-regulation (also referred to sometimes as self-control) is a broad term encompassing the ability to modulate one's thoughts, behaviors, and emotions. Blair and Diamond (2008) argue that self-regulation “emerges in the coordination of systems relating to emotional arousal and cognitive control, rather than the dominance of one over the other (p. 905).” Well-substantiated in the literature, the development of effective self-regulation may lead to success in school and peer relationships (e.g., Blair & Diamond, 2008; Graziano, Reavis, Keane, & Calkins, 2007; Ramani et al., 2010; Valiente, Lemery-Chalfant, Swanson, & Reiser, 2008).

Children's ability to regulate their thoughts, feelings, and behaviors in the classroom and with their peers is of particular relevance to the current study. Children who are able to sustain their concentration during class time are more likely to maintain higher academic performance in comparison to students who have difficulties with concentration (Rabiner, Murray, Schmid, & Malone, 2004). Attention control is a subcomponent of executive functioning, and executive functioning is also positively associated with children's achievement throughout the school years (Blair & Diamond, 2008; Bull, Espy, & Wiebe, 2008; Jacobson, Williford, & Pianta, 2011). In contrast, an inability to regulate negative emotions or behaviors may disrupt learning and achievement from childhood into adolescence (Masten et al., 2005).

Self-regulatory abilities play an important role in children's decisions to engage in risky behaviors. Good self-control may act as a buffer, protecting children from engaging in risky activities (e.g., Moffitt et al., 2011; Simons-Morton et al., 1999; Wills et al., 2002). Also, adolescents with good self-control are less likely to use substances even when they have experienced negative life events (Wills, Pokhrel, Morehouse, & Fenster, 2011) or have been exposed to alcohol and tobacco media messages (Wills et al., 2010). In contrast, poor behavioral self-control has been positively associated with middle and high school-aged children's intentions to use and actual use of alcohol and tobacco (Wills, et al., 2006; 2007). Low self-regulation (including sensation-seeking, impulsivity, and inability to control emotions) has also been related to alcohol use and involvement with deviant peers in early adolescence (Mason et al., 2011). In elementary school, children as young as nine years of age with poor executive functioning appeared to be at greater risk of engaging in substance use than children with higher executive functioning skills (Riggs, Spruijt-Metz, Chou, & Pentz, 2012).

Recently, Moffit and colleagues (2011) proposed that self-control should be targeted in early intervention efforts for all children. Specifically, in a three-decade longitudinal study, they found that those with high self-control in childhood had better physical health, higher socioeconomic status and income, and lower crime rates in adulthood than those with poor self-control in childhood (Moffit et al., 2011). Thus, developing prevention programs that facilitate the development of self-regulation is much needed. Using a unique developmental social cognitive neuroscience perspective, Zelazo & Lyons (2012) argued that mindfulness training has the potential to facilitate the growth of effective self-regulation in youth, because it supports more deliberate, top-down influences (e.g., sustained attention) while at

the same time reduces arousing, bottom-up influences (e.g., stress or anxiety). Training children in mindfulness in elementary school has the potential to equip them with skills to make more thoughtful, healthy decisions in their daily lives, decreasing the risk for substance abuse.

Mindfulness and yoga programs for youth

Mindfulness education has great potential for helping to cultivate healthy habits in children over time. There is growing research on mindfulness training programs with youth that has begun to identify benefits such as enhanced attention abilities, coping responses, emotion regulation, as well as reduced aggression, hostility, depression, anxiety, and feelings of discomfort (Biegel et al., 2009; Broderick & Metz, 2009; Mendelson et al., 2010; Napoli et al., 2005; Saltzman & Goldin, 2008; Schonert-Reichl & Lawlor, 2010; Sibinga, Kerrigan, Stewart, Johnson, Magyari, & Ellen, 2011). These programs include a number of practices such as mindful movements or yoga, breathing, or guided meditation, all of which can work together to provide children with a variety of opportunities to practice paying attention and being in the present moment.

Mindfulness practice provides the opportunity to become more aware of one's thoughts and feelings and resist reflexive, impulsive reactions to both. This may enable the growth of effective self-regulation in youth (Zelazo & Lyons, 2012). Consistent with this, children who participated in a mindfulness education program, compared to those that did not, exhibited fewer problem behaviors (i.e., aggressive and oppositional, Schonert-Reichl & Lawlor, 2010). In addition, participation in a mindful yoga intervention resulted in reductions in problematic responses to stress (e.g. rumination) for elementary and middle school-aged children in urban communities (Mendelson et al., 2010). Follow-up moderator analyses revealed that participation in this yoga intervention was associated with lowered impulsive action and involuntary engagement stress responses particularly for those students reporting low and medium baseline depressive symptoms (Gould, Dariotis, Mendelson, & Greenberg, 2012). Adolescents participating in a high school-based yoga intervention, which also included some mindfulness techniques, experienced increases in their ability to control anger and successfully cope with challenges compared to adolescents who did not participate in the intervention (Khalsa, Hickey-Schultz, Cohen, Steiner, & Cope, 2012).

Learning to observe and become aware of physiological, cognitive, and emotional cues may also foster children's ability to focus their attention. School-aged children who participated in mindfulness programs displayed increases in their attention abilities (Napoli et al., 2005; Schonert-Reichl & Lawlor, 2010; Saltzman & Goldin, 2008) and reductions in ADHD symptoms (van der Oord, Bögels, & Peijnenburg, 2012). Mindfulness education also has to potential to improve executive functioning more broadly. For example, elementary school-aged children's self-reported mindful awareness was positively associated with higher scores on a computerized executive functioning performance task (Oberle, Schonert-Reichl, Lawlor, & Thomson, 2012). Participation in another mindfulness program resulted in improvements in executive functioning scores for children with executive functioning difficulties (Flook, et al., 2010). Thus, mindfulness education in schools has the potential to

enhance children's self-regulatory abilities, which are important for academic and interpersonal success.

Mindfulness also plays an important role in youth's substance use intentions and behaviors. In a study of adolescents in China, Black and colleagues (Black, Sussman, Anderson Johnson, & Milam, 2012b) found that for adolescents low in trait mindfulness, intentions to smoke were positively related to actual smoking behaviors. Adolescents who may not be aware of their cognitions were more likely to engage in the unhealthy behavior (Black et al., 2012b). In a similar study, trait mindfulness had an indirect effect on adolescents' cigarette smoking through negative affect and stress perceptions, suggesting that mindfulness may protect youth from engaging in cigarette use by lessening distressful feelings and thoughts (Black et al., 2012a).

Mindfulness-based approaches are being used as part of larger multi-component behavioral interventions for youth to target their substance use. For example, adolescents who participated in a school-based tobacco cessation program (which includes yoga and meditation activities) were more likely to quit smoking and express higher motivation to quit smoking than those who did not participate (McCuller, Sussman, Wapner, Dent, & Weiss, 2006; Sussman, Dent, & Lichtman, 2001). In a sleep intervention following substance abuse treatment for adolescents, findings revealed that mindfulness meditation practice was associated with feelings of self-efficacy toward resisting substance use (Britton et al., 2010). Overall, these findings provide support for creating mindfulness-based programs that focus on youth's self-regulatory abilities in order to protect against substance use.

The *Master Mind* Program

Program content

The *Master Mind* curriculum is divided into four sections and each section represents one of the four foundations of mindfulness (Nhat Hanh, 1990). The first section, *Awareness of the Body*, focuses on teaching children how to be more aware of their bodies and sensations, and lessons include learning to be aware of breathing, the entire body, and the present moment. The second section, *Awareness of Feelings*, focuses on teaching children to become more aware of their emotions and lessons include teaching children how to appropriately express emotions and cultivate and deal with positive and negative emotions. The third section, *Awareness of Thoughts*, focuses on teaching children to understand how thoughts work and lessons include calming a busy mind, understanding that not all thoughts are facts, and letting thoughts go. The final section, *Awareness of Relationships,* focuses on teaching children how to understand other people's behaviors and communicate with others and lessons include learning how to show compassion towards oneself and others, as well as how to communicate in stressful or risky situations. Throughout each of the four sections of the program, students are provided with multiple opportunities to discuss how mindfulness practices might assist them when facing decisions about whether to engage in risky unhealthy activities (e.g., stopping and taking three breaths when experiencing stress or negative feelings; communication in situations with peer pressure and/or when alcohol or tobacco are present).

Embedded within the four sections are the five key features of the *Master Mind* program: 1) mindful breathing, 2) mindful journeys, 3) mindful movements (e.g., developmentally-appropriate yoga poses), 4) real-world applications, and 5) daily practice. Awareness of breathing is fundamental to mindfulness practice and is considered to be an anchor to the present moment (Kabat-Zinn, 1990). Thus, learning how to become aware of one's breathing is an important first step in the *Master Mind* Program and is highlighted in many of the program activities. Students were also guided through various audiotaped meditations (e.g., body scan). These meditations, based on meditations in the adult Mindfulness-Based Stress Reduction course, were adapted to be developmentally appropriate for elementary school-aged children.

In addition, students also had the opportunity to participate in mindful movements in order to be more aware of their bodies, movement, and breathing, as well as to achieve balance, stability, and strength. Most programs that teach mindful movements such as yoga utilize adult instructors; however, given that an important feature of effective prevention programs is the inclusion of peer-led activities (Cuijpers, 2002), elementary school-aged child actors served as instructors in the mindful movement videos. These child actors were trained by a certified yoga instructor and then were videotaped demonstrating and providing instruction on the mindful movements. The mindful movements were carefully selected by a certified yoga instructor to be developmentally appropriate and easy for children to learn. In addition, given the fact that the *Master Mind* program was designed to be taught during the regular school day, many of the movements included in the program were selected so that they could easily be performed at or next to students' desks.

Students also participated in real-world application exercises which allowed them to apply their new mindfulness skills to their own daily experiences. Providing opportunities for students to learn and practice new skills in active and engaging ways is a key characteristic that makes a preventive intervention program work successfully (Nation et al., 2003). The focus of these real-world applications was on making healthy choices (e.g., ignoring friends' request to ditch schoolwork), avoiding risky behaviors (e.g., trying a cigarette), and coping effectively with stress (e.g., being left out of a peer group). Students were presented with hypothetical vignettes of fellow peers experiencing a problem or challenge and as a class, the students used their new mindfulness skills to help solve the problems. The topics for the real-world vignettes were determined based on focus group discussions with 4th and 5th grade students conducted during the program development process. Finally, in addition to practicing mindfulness daily in class, the students also completed daily exercises in their student workbooks in order to continue their mindfulness practice outside of school.

Program development considerations

The *Master Mind* program development process was informed by the results of efficacy trials of previous prevention programs as well as research on effective implementation of school-based substance abuse prevention curricula (e.g., Botvin, Griffin, & Nichols, 2006; Ennett et al., 2003; Greenberg et al., 2003; Nation, et al., 2003). For example, intervention programs that include highly interactive and experiential activities have been associated with better youth outcomes and greater fidelity (Ennett, et al., 2003; Tobler, Roona, Ochshorn,

Marshall, Streke, & Stackpole, 2000). Interaction among students allows for them to exchange ideas, provide feedback to one another regarding the usage of newly acquired skills, and teach one another ways to handle problematic school and peer situations (Tobler et al., 2000). Thus, based upon these findings, every lesson in the *Master Mind* program included at least one experiential or interactive activity designed to enhance student engagement.

In addition to considering the pedagogical approach used in the curriculum, developmental capabilities were considered. Prevention programs for elementary school-aged children should be developed with children's cognitive and emotional capabilities in mind, and should be tailored to be developmentally appropriate and accessible to concrete-thinking, young minds (Fodor & Hooker, 2008). Cognitive and emotional developmental literature suggests that late elementary school-aged children possess the developmental competencies to learn, understand, and use mindfulness skills in their everyday lives. These abilities become more fully developed across childhood and adolescence. Examples of the growth of cognitive abilities have been demonstrated in studies of attention (e.g., Kim, Deater-Deckard, Mullineaux, & Allen, 2010); perspective taking (e.g., Choudhury, Blakemore, & Charmann, 2006) and executive functioning, which includes working memory, inhibitory control, and cognitive flexibility (e.g., Anderson, Anderson, Northman, Jacobs, & Catroppa, 2001; Jones, Rothbart, & Posner, 2003). In addition, children's emotional competencies are also forming throughout the school years. By elementary school, children can experience, express, and modulate a variety of emotions, as well as display a good understanding of their own and others' emotions (e.g., Bosacki & Moore, 2004; Camras et al., 1998; Dunn & Hughes, 1998; Russell & Widen, 2002; Pons, Lawson, Harris, & dePosnay, 2003; Pons, Harris, & deRosnay, 2004). With these developmental competencies in mind, lessons for the *Master Mind* program were created to be appropriate and accessible to children.

Program implementation

The *Master Mind* Program was taught by trained teachers daily over a four-week period and each lesson occurred once a day for approximately 15 minutes per lesson across approximately a one month period of time (equaling 20 lessons). Each week was structured to consist of four lessons introducing new concepts and skills with the fifth lesson culminating in practicing real-world application of mindfulness practices. The reasons for selecting the relatively short lesson length of 15 minutes taught daily were fourfold. First, the brevity of each session could allow the program to easily complement Common Core Standards in elementary school classrooms rather than detract excessively from academic learning time. Second, because the program could be used in a regular classroom context, students had the opportunity to learn and practice skills that could help them to calm down and focus in a real world setting. Third, teachers could potentially incorporate the program into natural transition points during the school day (e.g. before class starts or after lunch). Fourth, short lessons allowed for daily practice of mindfulness skills. Having regular, daily short mindfulness practice lessons provided a means of creating and potentially, maintaining healthy habits. Research with adults suggests that higher frequency of engagement in mindfulness practice is related to increases in positive outcomes (e.g., Carmody & Baer, 2008; Carson et al., 2004). It is possible that providing opportunities for consistent

mindfulness practice in the classroom may also serve to enhance the internalization of skills and the development of important self-regulatory abilities (e.g., Diamond & Lee, 2011; MLERN, 2012).

Research Aims

A small randomized controlled trial of the effectiveness of the *Master Mind* program was conducted in two elementary schools with two aims. The first aim was to assess the *Master Mind* program's potential for changing youth outcomes. Specifically, it was hypothesized that students who participated in the *Master Mind* program, in comparison to students who did not, would experience improvements in their cognitive, emotional, and behavioral regulatory abilities, and reductions in their intentions to use substances. The second aim was to evaluate the fidelity and feasibility of the *Master Mind* program including determining whether teachers implemented the four-week, 15-minute daily lessons in the classroom, and if teachers and students were satisfied with the program.

Method

Participants

Emails were sent to elementary school principals and teachers in a rural public school system in a southeastern state containing information about the research project and the *Master Mind* program. Interested 4th and 5th grade teachers from two schools contacted the research staff for additional information. The two schools were then randomly assigned to be in one of two conditions: the intervention group (*Master Mind* implemented in classroom) or wait-list control (regular education curriculum) group. The two elementary schools were from the same county and public school system. One school had slightly larger classroom sizes than the other. All students in intervention classrooms took part in the four-week *Master Mind* Program; however, only students with parent permission and youth assent participated in the evaluation of the *Master Mind* program. In total, 111 students participated in the evaluation of the program with 71 students in the intervention (30 boys, 41 girls) group and 40 students in the control (17 boys, 23 girls) group. Students ranged in age from 9 to 11 years old (M = 10.09, SD = .51). Table 1 provides additional demographic information about the students in each of the groups and as a whole.

Measures

Executive functioning—Children's executive functioning (inhibitory control, cognitive flexibility, and working memory) was measured by overall scores on the Flanker Fish task (Diamond et al., 2007). Children identify a target item (arrow within a colored fish) while ignoring one or more distracting items that flank the target and whose identities may activate the correct or incorrect response. The task consists of three conditions. In the Flanker/Blue Fish condition (17 trials), participants are asked to indicate the direction of the central/middle fish (target) that is pointing to the left or to the right with a keypress response. The target is flanked by two identical fish on either side (distractors) that are either pointing in the same direction (*congruent* trial) or the opposite direction of the target fish (*incongruent* trial). In the Reverse Flanker / Pink Fish condition (17 trials), participants are asked to

indicate the direction of the outside/flanking fish (target). In the Mixed Flanker condition (45 trials), participants receive both congruent and incongruent trials. The number of overall correct responses across the three tasks was used as the outcome variable for executive functioning. Versions of this Flanker task have been utilized in other intervention studies with children (Diamond et al., 2007).

Intentions to use substances—Children's intentions to use alcohol and tobacco in the future were assessed by child self-report ratings on the Intentions to Use Alcohol and Tobacco scale (Kupersmidt, Scull, & Austin, 2010). Eight items were rated using a four-point scale between 0 (*I definitely will not*) to 3 (*I definitely will*). Examples of items include: “Before you are 21 years old, do you think you will drink beer, wine, or hard liquor (more than just a few sips)?”, “Before you are 18 years old, do you think you will smoke cigarettes?” This measure has demonstrated good reliability and validity in an evaluation of a school-based media literacy program with elementary school-aged children (Kupersmidt et al., 2010).

Behavior and emotion regulation—Children's adaptive functioning and behavioral/emotional problems in the classroom were assessed by teachers on the Children's Behavior Checklist-Teachers Report Form (C-TRF; Achenbach & Rescorla, 2001). The teachers rated each participating student for how true each of the 118 items was within the past month, using a three-point response scale: 0 = not true (as far as you know); 1 = somewhat or sometimes true; 2 = very true or often true. The scales of interest on the C-TRF were: aggression problems, attention problems, social problems, and anxiety/depression Problems. The C-TRF scales have high test-retest reliability and good construct validity with other child behavior scales (Achenbach & Rescorla, 2001). Teachers also assessed children's cognitive and behavioral skills related to self-control on the Self-Control Rating Scale (SCRS; Kendall & Wilcox, 1979). The SCRS consists of 33 items and teachers rated each student using a 7-point Likert scale ranging from Always (1) to Never (7). The values were reverse coded so that a higher score represented better self-control. This scale has demonstrated high reliability and good validity with other measures of child behavior (Kendall & Wilcox, 1979; Kendall, Zupan, & Braswell, 1981).

Implementation fidelity—A trained observer rated each teacher's fidelity of implementation in the three intervention classrooms. Using a 4-point Likert scale (1 = Not At All Taught to 4 = Thoroughly Taught), the observer rated how much of each section of each lesson was taught by teachers. The goal was to observe 75% or more of the lessons taught of the *Master Mind* program in each of the intervention classrooms. In addition, the observer responded to two open-ended questions for each of the observed lessons in order to address whether or not teachers met the lesson goals and objectives, and if teachers modified any part of the lessons.

Program feasibility—Teachers in the intervention group were interviewed by a member of the research team and provided verbal ratings and responses to open-ended questions. First, using 5-point Likert scales (1 = Not at all to 5 = Extremely), teachers rated their overall impressions of the content and materials of each week of the program, their

enjoyment in teaching the program, and the ease of preparation and implementation. Higher ratings on the Likert scale indicated more positive feedback. Second, teachers were also asked to provide any suggestions on how to improve the program.

In addition, students in the intervention group were asked to complete a Consumer Satisfaction Questionnaire to assess their overall opinions about the *Master Mind* lessons and activities (e.g., How much did you enjoy participating in the *Master Mind* program and the activities?) using a 5-point Likert scales (1 = Not at all to 5 = Extremely). Higher ratings on the Likert scale indicated more positive feedback. Students also responded to an open-ended question (i.e., "What is the most important thing that you learned from the *Master Mind* program?").

Procedure

Two elementary schools in a southeastern state were randomly assigned to participate as part of an intervention group or wait-list control group. At the intervention school, teachers implemented the *Master Mind* program in their classrooms for four weeks. At the wait-list control school, teachers went about 'business as usual' and followed their regular education curriculum. Teachers in the intervention group received a Teacher Manual containing 20 scripted lessons and additional instructional resources (i.e., audio CD, DVD, posters, student workbooks, website). Prior to implementing the *Master Mind* program, teachers participated in an eight-hour training session, conducted by the program developer, to become familiar with the principles of mindfulness, as well as the main components of the program. Teachers completed a post-training survey to test their knowledge of the training material. Based on responses from this survey, teachers appeared to have a good understanding of mindfulness, its benefits for the classroom, and the curriculum itself. These survey responses provided some initial evidence that the training content and duration may have been sufficient for teachers to be adequately prepared to teach the *Master Mind* program.

Teachers and students from both schools participated in the pre- and post-test data collection. A member of the research team distributed and proctored the completion of the student pre-test questionnaires. Teachers completed pre-test ratings on their students' behaviors in the classroom on a separate day. Following the in-class questionnaire administration, individual students were escorted by a research assistant to a quiet location selected by teachers (e.g., media center) to complete a brief computer task (i.e., the Flanker Fisk task). Students at the intervention school were then taught the 4-week program by their classroom teacher. Teachers in the intervention group were instructed to implement the *Master Mind* program in their classrooms every day for 15 minutes/day for 20 consecutive days following the pre-test data collection. For each lesson, teachers were asked to complete a daily fidelity checklist. Members of the research team also observed the lessons implemented in the classrooms. Wait-list control classrooms participated in their regular curricula and did not participate in any mindfulness program during those four weeks. Afterward, the research team returned to collect post-test data from students and teachers in the same manner as the pre-test data collection. Additionally, students and teachers in the intervention group completed program feasibility and consumer satisfaction ratings.

Data Analytic Plan

Preliminary analyses included a test of randomization effectiveness, examination of missing data, and correlation analyses. Main outcome analyses examined the effect of the intervention on the proposed outcome variables (i.e., executive functioning, behavior and emotion regulation, and intentions to use alcohol or tobacco) using SAS PROC MIXED, which accounts for within-class heterogeneity, with students nested within classroom. Hierarchical liner model analyses were used to investigate differences in the outcome variables by using condition (intervention/control), gender (male/female), and the interaction of condition and gender as independent variables. Pre-test scores for each dependent variable were included as predictor variables; therefore, dependent variable means are reported as adjusted post-test mean scores (which control for variations in pre-test levels).

Results

Preliminary Analyses

Test of randomization effectiveness—Preliminary analyses examined whether the randomization of schools produced approximately equal samples with respect to demographic characteristics between the two groups. Control and intervention groups were found not to differ significantly ($p > .05$) by age using a t-test analysis or on any categorical demographic variable (i.e., gender, race, ethnicity) using chi-squared analyses.

Missing data—Missing data for most of the outcome variables ranged from 3-6% and was therefore inconsequential given the small proportion. One outcome variable, the overall executive functioning score, had 12% missing data, which was a concern. However, missingness was related to school closure due to inclement weather, which is completely random. Thus, the assumption of missing completely at random is reasonable and it is believed the estimates will not be biased. To confirm this, additional analyses were conducted to determine if the two groups (intervention and wait-list control) were still comparable after accounting for the 12% missing data on the executive functioning score. Findings from the test of randomization effectiveness revealed that the intervention and wait-list control groups did not differ significantly on age, gender, race, or ethnicity. Thus, both groups remained comparable on relevant student characteristics.

Correlation analyses—Correlations among all pre-test variables were computed (see Table 2). Correlation coefficients among the pre-test outcome variables were as expected with significant negative correlations between executive functioning and attention problems and social problems, as well as a significant positive correlation between executive functioning and self-control abilities. Students' reports of intentions to use alcohol and tobacco were also positively correlated with attention and aggressive problems, and negatively correlated with self-control abilities.

Main Outcome Findings

Results of significant findings for main effects and interactions, including means, standard deviations, and effect sizes (Cohen's *d*) for the intervention group can be found in Table 3. The students in the intervention group had higher executive functioning skills at post-test

compared to students in the control group, $F(1,90) = 7.15$, $p < .01$. In addition, students in the intervention group had lower teacher-rated social problems, $F(1, 101) = 4.49$, $p < .05$, and aggressive behaviors, $F(1,101) = 7.30$, $p < .01$ at post-test in contrast to students in the control group.

No significant differences were found at post-test between the intervention and control groups for teacher-rated attention problems, $F(1, 101) = .66$, $p > .05$, or for students' intentions to use alcohol or tobacco, $F(1, 96) = .59$, $p > .05$.

Gender was found to moderate some emotion and behavior regulation outcomes. Specifically, girls in the intervention group had lower teacher-rated anxiety at post-test as compared to the girls in the control group, $F(1,99) = 5.00$, $p < .05$. Although only marginally significant, boys in the intervention group appeared to have better teacher-rated self-control in comparison to boys in the control group, $F(1,99) = 3.29$, $p < .10$.

Implementation Fidelity and Feasibility

Observer-rated fidelity—As proposed, at least 75% of the lessons were observed (at least 15 out of 20 lessons) by an independent observer. Using a 4-point Likert scale, observers reported that the sections of each lesson were thoroughly taught, on average, by the three intervention group teachers in their ratings ($M = 3.99$).

Observations conducted across the three classrooms also revealed that the three teachers met the goals and objectives for each of the lessons observed by explaining the mindfulness concepts and having students participate in the activities included in each lesson (e.g., mindful journeys, mindful movements). Some teachers were observed to have slightly modified activity instructions to make them clearer to their students. Also, in addition to the school-based examples provided in the program, some teachers supplemented these by providing additional school-based examples to help their students relate mindfulness concepts to their everyday lives.

Teacher-rated feasibility—Overall, teachers reported that they enjoyed teaching the lessons, and found them easy to prepare and teach. Teachers all reported that they greatly enjoyed teaching the *Master Mind* program to their students ($M = 5.0$). For the first three weeks of the program (i.e., awareness of body, feelings, and thoughts), teachers uniformly gave the maximum positive scores for ease of preparation and ease of implementation ($M = 5.0$). Week 4 (i.e., awareness of relationships) received slightly lower ratings from teachers in comparison to the previous weeks on ease of preparation (M = 4.3) and ease of implementation ($M = 3.4$). These slightly lower ratings may have been due to students demonstrating some difficulty in their understanding of showing compassion to others. Teachers gave recommendations for making this lesson on compassion more developmentally appropriate in the future. Teachers also recommended the inclusion of additional mindful movement activities in the program given the students' enthusiasm for learning these types of skills. Finally, although teachers reported that the length of time it took to teach each lesson made it feasible to integrate the program into the regular school day, they also suggested extending some of the lessons to allow for more time for reflection and discussion of certain topics.

Student-rated satisfaction—Students reported that they enjoyed participating in the *Master Mind* program ($M = 3.5$) and learned new information from it ($M = 3.6$). Students reported that their favorite activity was mindful eating ($M = 4.0$) and their least favorite activity was tracking their daily experience of positive emotions ($M = 2.4$). When asked about the most important thing that they learned from the program, several students replied they learned the importance of being mindful and how to be mindful in their everyday lives, in particular, stopping to pause and take three breaths.

Discussion

Developing and implementing mindfulness education programs in elementary school classrooms has the potential to positively influence the development of children's cognitive, behavioral, and emotional regulatory abilities. This study is the first to examine the feasibility and effectiveness of the *Master Mind* program, a mindfulness education, substance abuse prevention program for late elementary school students. The program includes five key ingredients: mindful breathing, mindful journeys, mindful movements, real-world applications, and daily practice; all of which worked in partnership to provide students with unique skills to use in their everyday lives. Of most importance was examining the potential impact of teaching mindfulness in a classroom on students' cognitive (e.g., executive functioning), behavioral (e.g., aggression), and emotion (e.g., anxiety) regulatory outcomes. As a function of participating in the *Master Mind* program, students in the intervention group had higher executive functioning skills at post-test as measured by their performance on an executive functioning task in contrast to students in the control group. In addition, students in the intervention group received lower ratings of social problems and aggressive behaviors by their teachers at post-test than students in the control group. Gender also moderated an important outcome: girls in the intervention group had lower anxiety problems as rated by teachers at post-test in comparison to girls in the control group. These findings contribute to the growing support for teaching mindfulness in schools and the positive impact of mindfulness education on students' cognitive and social-emotional abilities (e.g., Flook et al., 2010; Mendelson et al., 2010; Schonert-Reichl & Lawlor, 2010).

The *Master Mind* program received positive ratings from teachers and students with both groups expressing enjoyment and interest in teaching and learning from the four-week mindfulness program. Based on observations of teacher implementation of the *Master Mind* program, the program was taught with a high level of fidelity, which provided students with exposure to the complete curriculum and structured opportunities to practice mindfulness on a daily basis. Future prevention programs might consider lesson length (15 minutes), frequency (20 daily consecutive lessons), and time of day (following a natural transition, i.e., start of the school day) as important program features that may contribute to supporting high levels of fidelity of implementation. Teachers also indicated that it was easy to prepare for and teach the lessons in their classrooms, providing further evidence for the feasibility of implementing this program in elementary school classrooms.

Developing the ability to observe and be aware of one's thoughts and feelings through mindfulness practice, rather than react automatically or impulsively, is important for children to learn how to regulate their emotions and behaviors both inside and outside of the

classroom. As early as elementary school, children are forming beliefs and expectations about substance use, many of which are positive (e.g., Andrews et al. 2003; Miller et al., 1990). In addition, many youth believe that one way to reduce stressful or negative feelings is by smoking cigarettes (Freeman, Brucks, & Wallendorf, 2005). It is possible that one way to effectively cope with these types of negative feelings is by practicing mindfulness, which may enhance children's ability to reflect on and think more flexibly about the emotional experience. These self-regulatory abilities may then contribute to preventing youth from turning to risky health behaviors such as substance use as a coping mechanism. Furthermore, it is becoming well-known that children can benefit from the development of effective self-regulation. Such benefits include improved academic learning and performance and social competence, as well as reduced substance use or criminal activity (Blair & Diamond, 2008; Jacobson, Williford, & Pianta, 2011; Olson et al., 2011; Ramani et al., 2010; Wills et al., 2011). These benefits can be seen across adolescence and adulthood (e.g., Masten et al., 2005; Moffit et al. 2011). Thus, mindfulness education programs have the potential to provide children with skills and resources to succeed in their everyday lives.

Although it was hypothesized that students would report a reduction in their intentions to use substances in the future as a function of participating in the *Master Mind* program, no significant differences were found between the intervention and control groups on students' intentions to use alcohol or tobacco. Notably, approximately 90% of the students had very low or no intentions to use alcohol or tobacco in the future suggesting a floor effect. This lack of variability likely contributed to our inability to detect any change in students' intentions to use as a function of the intervention. Future research utilizing a larger sample and a longer follow-up interval may result in greater variability in student substance use intentions and greater potential to see change in substance use outcomes.

Despite the promising findings for this new mindfulness education program, there are some limitations of this study that should be considered. First, many of the student outcomes, in which there were significant changes in the intervention group, were based on teacher ratings. As is often the case with evaluations of school-based programs, the teachers in the intervention group were not blind to their group assignment. Because of this, it is possible that the teacher ratings of student outcomes may have been biased. However, it is important to note that teacher ratings were not the only measures in the current study. Students also completed an objective performance task of executive functioning in which students in the intervention group improved significantly in executive functioning compared to students in the control group. Second, teachers in the intervention group participated in mindfulness training as part of a one-day teacher training workshop. Recent studies have shown that teachers who practice mindfulness experience reductions in psychological symptoms, occupational stress, and burnout as well as increases in focused attention, working memory, and self-compassion (Franco, Mañas, Cangas, Moreno, and Gallego, 2010; Gold et al., 2010, Jennings, Snowberg, Coccia, & Greenberg, 2011, Roeser et al., 2012). In the current study, although the teacher training workshop was only one day, it is possible that learning mindfulness influenced teachers' behavior, in general. If so, teachers' behavior may have improved the overall classroom climate, the quality of their interactions with students, and their ratings of their students' behaviors. Thus, the observed changes in students' self-regulation may have been a consequence of teacher behavior rather than solely due to

exposure to the curriculum. However, the current study design was not developed to disentangle these effects from one another. Third, the study was conducted in only two elementary schools located in one school system which makes the generalizability of the findings somewhat limited. Finally, the current study explored the impact of mindfulness education on student outcomes by comparing an intervention group to a wait-list control group. It is difficult to determine whether mindfulness is the main active ingredient in producing changes in student outcomes because the *Master Mind* program was not compared to an active control group (e.g., a program with a different approach that has the potential to improve similar student outcomes) (e.g., MacCoon et al., 2012; Zelazo & Lyons, 2012).

To continue the investigation of the impact of the *Master Mind* program on elementary school students, a fully powered, longitudinal, randomized controlled trial with an active control group is needed. Furthermore, increasing the number of participating schools and the range of communities in which the schools are recruited would not only enhance the potential to see change in student outcomes, but also, enhance the generalizability of the findings. This type of study would also allow for closer examination of school, teacher, and student variables that might moderate the effectiveness of the program. Adding more measures from multiple informants (e.g., teacher, student, parent, and observer) would also strengthen conclusions about the impact of the intervention on youth outcomes. Another important direction for future research is an examination of potential mediators of mindfulness training on student outcomes (Greenberg & Harris, 2012). For example, mindfulness education of an entire classroom or school has the potential to create supportive relationships between teachers and students and a more enjoyable, caring learning environment (Jennings, Snowberg, Coccia, & Greenberg, 2011; Roeser, Skinner, Beers, & Jennings, 2012), which may, in turn, mediate the impact of the intervention on more distal behavioral youth outcomes such as substance use. Self-regulatory abilities, as another example, may also mediate the impact of a mindfulness education program on youth's risky behaviors. Finally, disentangling the effects of mindfulness teacher training from curriculum exposure could be addressed in a future study through utilizing a multiple group factorial design with schools randomly assigned to different intervention conditions.

In conclusion, the current study supports the potential effectiveness and feasibility of teaching mindfulness daily to elementary school-aged children in a classroom setting. The findings from this study add to the growing research literature suggesting that school-aged children, teachers, and school settings benefit from the integration of mindfulness education programs and brief, daily practices into the regular school day. Programs such as the *Master Mind* program provide educators with an easy-to-implement curriculum that has the potential to increase students' self-regulatory abilities. Further research is needed to determine whether the program has an impact on youth's behavioral, emotional, and cognitive functioning, and whether the intervention can be scaled, sustained, and generalized to diverse schools and students. Such research is needed to support the development of effective approaches to helping children develop self-regulatory abilities and avoid risky health behaviors such as substance abuse in response to stress.

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References

Achenbach, TM.; Rescorla, LA. Manual for the ASEBA School-Age Forms & Profiles. University of Vermont, Research Center for Children, Youth, & Families; Burlington, VT: 2001.

Anderson V, Anderson P, Northam E, Jacobs R, Catroppa C. Development of executive functions through late childhood and adolescence in an Australian sample. Developmental Neurology. 2001; 20:385–406.

Andrews JA, Tildesley E, Hops H, Duncan SC, Severson HH. Elementary School Age Children's Future Intentions and Use of Substances. Journal of Clinical Child and Adolescent Psychology. 2003; 32(4):556–567. doi:10.1207/S15374424JCCP3204_8. [PubMed: 14710464]

Andrews JA, Hampson S, Barckley M. The effect of subjective normative social images of smokers on children's intentions to smoke. Nicotine & Tobacco Research. 2008; 10(4):589–597. doi: 10.1080/14622200801975819. [PubMed: 18418781]

Biegel G, Brown K, Shapiro S, Schubert C. Mindfulness-based stress reduction for the treatment of adolescent psychiatric outpatients: A randomized clinical trial. Journal of Consulting and Clinical Psychology. 2009; 77(5):855–866. [PubMed: 19803566]

Black DS, Milam J, Sussman S, Anderson Johnson C. Testing the indirect effect of trait mindfulness on adolescent cigarette smoking through negative affect and perceived stress mediators. Journal of Substance Use. 2012a; 17:417–429. [PubMed: 23847448]

Black DS, Sussman S, Anderson Johnson C, Milam J. Trait mindfulness helps shield decision-making from translating into health-risk behavior. Journal of Adolescent Health. 2012b; 51:588–592. [PubMed: 23174469]

Blair C, Diamond A. Biological processes in prevention and intervention: The promotion of self-regulation as a means of preventing school failure. Development and Psychopathology. 2008; 20:899–91. [PubMed: 18606037]

Bosacki SL, Moore C. Preschoolers' understanding of simple and complex emotions: Links with gender and language. Sex Roles. 2004; 50:659–675.

Botvin GJ, Griffin KW, Nichols T. Preventing youth violence and delinquency through a universal school-based prevention approach. Prevention Science. 2006; 7(4):403–408. doi:10.1007/s11121-006-0057-y. [PubMed: 17136462]

Britton WB, Bootzin RR, Cousins JC, Hasler BP, Peck T, Shapiro SL. The contribution of mindfulness practice to a multicomponent behavioral sleep intervention following substance abuse treatment in adolescents: A treatment-development study. Substance Abuse. 2010; 31(2):86–97. doi: 10.1080/08897071003641297. [PubMed: 20408060]

Broderick PC, Metz S. Learning to BREATHE: A pilot trial of a mindfulness curriculum for adolescents. Advances in School Mental Health Promotion. 2009; 2:35–46.

Bull R, Espy K, Wiebe SA. Short-term memory, working memory, and executive functioning in preschoolers: Longitudinal predictors of mathematical achievement at age 7 years. Developmental Neuropsychology. 2008; 33(3):205–228. doi:10.1080/87565640801982312. [PubMed: 18473197]

Camras LA, Oster H, Campos J, Campos R, Ujiie T, Miyake K, Meng Z. Production of emotional facial expressions in European American, Japanese, and Chinese infants. Developmental Psychology. 1998; 34(4):616–628. doi:10.1037/0012-1649.34.4.616. [PubMed: 9681253]

Carmody J, Baer RA. 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. 2008; 31:23–33. [PubMed: 17899351]

Carson JW, Carson KM, Gil KM, Baucom DH. Mindfulness-based relationship enhancement. Behavior Therapy. 2004; 35:471–494.

Choudhury S, Blakemore S, Charman T. Social cognitive development during adolescence. Social Cognitive and Affective Neuroscience. 2006; 1(3):165–174. doi:10.1093/scan/nsl024. [PubMed: 18985103]

Compas BE, Conner-Smith JK, Saltzman H, Thomsen AH, Wadsworth ME. Coping with stress during childhood and adolescence: Problems, progress, and potential in theory and research. Psychological Bulletin. 2001; 127:87–127. [PubMed: 11271757]

Cuijpers P. Peer-led and adult-led school drug prevention: A meta-analytic comparison. Journal of Drug Education. 2002; 32(2):107–119. doi:10.2190/LPN9-KBDCHPVB-JPTM. [PubMed: 12206061]

Diamond A, Barnett WS, Thomas J, Munro S. Preschool program improves cognitive control. Science. 2007; 318:1387–1388. [PubMed: 18048670]

Diamond A, Lee K. Interventions shown to aid executive function development in children 4–12 years old. Science. 2011; 333:959–964. [PubMed: 21852486]

Dunn J, Hughes C. Young children's understanding of emotions within close relationships. Cognition and Emotion. 1998; 12:171–190.

Ennett ST, Ringwalt CL, Thorne J, Rohrbach LA, Vincus A, Simons-Rudolph A, Jones S. A Comparison of current practice in school-based substance use prevention programs with meta-analysis findings. Prevention Science. 2003; 4:1–14. [PubMed: 12611415]

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

Fodor IE, Hooker KE. Teaching mindfulness to children. Gestalt Review. 2008; 12:75–91.

Franco C, Manas I, Cangas AJ, Moreno E, Gallego J. Reducing teachers' psychological distress through a mindfulness training program. The Spanish Journal of Psychology. 2010; 13:655–666. [PubMed: 20977015]

Freeman D, Brucks M, Wallendorf M. Young children's understandings of cigarette smoking. Addiction. 2005; 100:1537–1545. [PubMed: 16185215]

Gold E, Smith A, Hopper I, Herne D, Tansey G, Hulland C. Mindfulness-based stress reduction (MBSR) for primary school teachers. Journal of Child and Family Studies. 2010; 19:184–189.

Gould L, Dariotis JK, Mendelson T, Greenberg MT. A school based mindfulness intervention for urban youth: Exploring moderators of intervention effects. Journal of Community Psychology. 2012; 40(8):968–982. doi:10.1002/jcop.21505.

Graziano PA, Reavis RD, Keane SP, Calkins SD. The role of emotion regulation in children's early academic success. Journal of School Psychology. 2007; 45:3–19. [PubMed: 21179384]

Greenberg MT, Harris AR. Nurturing mindfulness in children and youth: Current state of research. Child Development Perspectives. 2012; 6(2):161–166. doi:10.1111/j.1750-8606.2011.00215.x.

Greenberg MT, Weissberg RP, O'Brien MU, Zins GE, Fredericks L, Resnik H, Elias MJ. Enhancing school-based prevention and youth development through coordinated social, emotional, and academic learning. American Psychologist. 2003; 58:466–474. [PubMed: 12971193]

Hampson SE, Andrews JA, Barckley M, Severson HH. Personality predictors of the development of elementary school children's intentions to drink alcohol: The mediating effects of attitudes and subjective norms. Psychology of Addictive Behaviors. 2006; 20(3):288–297. doi: 10.1037/0893-164X.20.3.288. [PubMed: 16938066]

Jacobson LA, Williford AP, Pianta RC. The role of executive function in children's competent adjustment to middle school. Child Neuropsychology. 2011; 17(3):255–280. doi: 10.1080/09297049.2010.535654. [PubMed: 21246422]

Jennings PA, Snowberg KE, Coccia MA, Greenberg MT. Improving classroom learning environments by Cultivating Awareness and Resilience in Education (CARE): Results of two pilot studies. Journal of Classroom Interaction. 2011; 46(1):37–48.

Jones L, Rothbart MK, Posner MI. Development of executive attention in preschool children. Developmental Science. 2003; 6(5):498–504. doi:10.1111/1467-7687.00307.

Kabat-Zinn, J. Full catastrophe living: Using the wisdom of your body and mind to face stress, pain and illness. Delacorte; New York: 1990.

Kabat-Zinn J. Mindfulness-based interventions in context: Past, present, and future. Clinical Psychology: Science and Practice. 2003; 10:144–156.

Kabat-Zinn, J. Wherever you go, there you are: Mindfulness meditation in everyday life. Hyperion; New York: 1994.

Kaplow JB, Curran PJ, Dodge KA, The Conduct Problems Prevention Research Group. Child, parent, and peer predictors of early-onset substance use: A multisite longitudinal study. Journal of Abnormal Child Psychology. 2002; 30:199–216. [PubMed: 12041707]

Kendall PC, Wilcox LE. A cognitive-behavioral treatment for impulsivity: Concrete versus conceptual training in non-self-controlled problem children. Journal of Consulting and Clinical Psychology. 1979; 198:48, 80–91.

Kendall PC, Zupan BA, Braswell L. Self-control in children: Further analyses of the Self-Control Rating Scale. Behavior Therapy. 1981; 12:667–681.

Khalsa SS, Hickey-Schultz L, Cohen D, Steiner N, Cope S. Evaluation of the mental health benefits of yoga in a secondary school: A preliminary randomized controlled trial. The Journal of Behavioral Health Services & Research. 2012; 39(1):80–90. doi:10.1007/s11414-011-9249-8. [PubMed: 21647811]

Kim J, Deater-Deckard K, Mullineaux PY, Allen B. Longitudinal studies of anger and attention span: Context and informant effects. Journal of Personality. 2010; 78(2):419–440. doi:10.1111/j.1467-6494.2010.00621.x. [PubMed: 20433625]

King KM, Chassin L. Adolescent stressors, psychopathology, and young adult substance dependence: A prospective study. Journal of Studies on Alcohol and Drugs. 2008; 69(5):629–638. [PubMed: 18781237]

Kupersmidt JB, Scull TM, Austin E. Media literacy education for elementary school substance use prevention: Study of Media Detective. Pediatrics. 2010; 126:525–536. [PubMed: 20732940]

Levin IP, Hart SS, Weller JA, Harshman LA. Stability of choices in a risky decision-making task: A 3-year longitudinal study with children and adults. Journal of Behavioral Decision Making. 2007; 20(3):241–252. doi:10.1002/bdm.552.

MacCoon DG, Imel ZE, Rosenkranz MA, Sheftel JG, Weng HY, Sullivan JC, Lutz A. The validation of an active control intervention for Mindfulness Based Stress Reduction (MBSR). Behaviour Research & Therapy. 2012; 50:3–12. [PubMed: 22137364]

Mason WA, Hitch JE, Spoth RL. Longitudinal relations among negative affect, substance use, and peer deviance during the transition from middle to late adolescence. Substance Use and Misuse. 2009; 44:1142–1159. doi:10.1080/10826080802495211. [PubMed: 19544145]

Mason W, Toumbourou JW, Herrenkohl TI, Hemphill SA, Catalano RF, Patton GC. Early age alcohol use and later alcohol problems in adolescents: Individual and peer mediators in a bi-national study. Psychology of Addictive Behaviors. 2011; 25(4):625–633. doi:10.1037/a0023320. [PubMed: 21553944]

Masten AS, Roisman GI, Long JD, Burt KB, Obradović J, Riley JR, Tellegen A. Developmental Cascades: Linking Academic Achievement and Externalizing and Internalizing Symptoms Over 20 Years. Developmental Psychology. 2005; 41(5):733–746. doi:10.1037/0012-1649.41.5.733. [PubMed: 16173871]

McCuller WJ, Sussman S, Wapner M, Dent C, Weiss DJ. Motivation to quit as a mediator of tobacco cessation among at-risk youth. Addictive Behaviors. 2006; 31:880–888. [PubMed: 16139963]

Mendelson T, Greenberg MT, Dariotis JK, Gould L, Rhoades BL, Leaf PJ. Feasibility and preliminary outcomes of a school-based mindfulness intervention for urban youth. Journal of Abnormal Child Psychology. 2010; 38(7):985–994. doi:10.1007/s10802-010-9418-x. [PubMed: 20440550]

Mind and Life Education Research Network (MLERN). Contemplative practices and mental training: Prospects for American education. Child Development Perspectives. 2012; 6(2):146–153. [PubMed: 22905038]

Miller P, Smith G, Goldman MS. Emergence of alcohol expectancies in childhood: a possible critical period. Journal of Studies on Alcohol. 1990; 51:343–349. [PubMed: 2359308]

Moffitt TE, Arseneault L, Belsky D, Dickson N, Hancox RJ, Harrington H, Caspi A. A gradient of childhood self-control predicts health, wealth, and public safety. PNAS Proceedings of the

National Academy of Sciences of the United States of America. 2011; 108(7):2693–2698. doi: 10.1073/pnas.1010076108.

Napoli M, Krech PR, Holley LC. Mindfulness Training for Elementary School Students: The Attention Academy. Journal of Applied School Psychology. 2005; 21:99–125.

Nation M, Crusto C, Wandersman A, Kumpfer KL, Seybolt D, Morrissey-Kane E, Davino K. What works in prevention: Principles of effective prevention programs. American Psychologist. 2003; 58:449–456. [PubMed: 12971191]

Nhat Hanh, T. Transformation and Healing: Sutra on the Four Establishments of Mindfulness. Parallax Press; 1990.

Noel JG, Thomson N. Children's alcohol cognitions prior to drinking onset: Discrepant patterns from implicit and explicit measures. Psychology of Addictive Behaviors. 2012; 26(3):451–459. doi: 10.1037/a002553. [PubMed: 21928865]

Oberle E, Schonert-Reichl KA, Lawlor MS, Thomson KC. Mindfulness and inhibitory control in early adolescence. Journal of Early Adolescence. 2012; 32:565–588. doi:10.1177/0272431611403741.

Olson SL, Lopez-Duran N, Lunkenheimer ES, Chang H, Sameroff AJ. Individual differences in the development of early peer aggression: Integrating contributions of self-regulation, theory of mind, and parenting. Development and Psychopathology. 2011; 23(1):253–266. doi:10.1017/S0954579410000775. [PubMed: 21262052]

Pasch KE, Perry CL, Stigler MH, Komro KA. Sixth grade students who use alcohol: Do we need primary prevention programs for “tweens”?. Health Education & Behavior. 2009; 36(4):673–695. doi:10.1177/1090198107308374. [PubMed: 18303109]

Pons F, Harris PL, de Rosnay M. Emotion comprehension between 3 and 11 years: Developmental periods and hierarchical organization. European Journal of Developmental Psychology. 2004; 1(2): 127–152. doi:10.1080/17405620344000022.

Pons F, Lawson J, Harris P, de Rosnay M. Individual differences in children's emotion understanding: Effects of age and language. Scandinavian Journal of Psychology. 2003; 44:347–353. [PubMed: 12887556]

Rabiner DL, Murray DW, Schmid L, Malone PS. An exploration of the relationship between ethnicity, attention problems, and academic achievement. School Psychology Review. 2004; 33:498–509.

Ramani GB, Brownell CA, Campbell SB. Positive and negative peer interaction in 3- and 4-year-olds in relation to regulation and dysregulation. The Journal of Genetic Psychology: Research and Theory on Human Development. 2010; 171(3):218–250. doi:10.1080/00221320903300353.

Repetti, RL.; McGrath, EP.; Ishikawa, SS. Daily stress and coping in childhood and adolescence.. In: Goreczny, AJ.; Hersen, M., editors. Handbook of pediatric and adolescent health psychology. Allyn & Bacon; Needham Heights, MA: 1999. p. 343-360.

Riggs NR, Spruijt-Metz D, Chou C, Pentz P. Relationships between executive cognitive function and lifetime substance use and obesity-related behaviors in fourth grade youth. Child Neuropsychology. 2012; 18:1–11. [PubMed: 21480013]

Roeser RW, Skinner E, Beers J, Jennings PA. Mindfulness training and teachers' professional development: An emerging area of research and practice. Child Development Perspectives. 2012; 6(2):167–173. doi:10.1111/j.1750-8606.2012.00238.x.

Russell JA, Widen SC. Words versus faces in evoking preschool children's knowledge of the causes of emotions. International Journal of Behavioral Development. 2002; 26:97–103.

Saltzman, A.; Goldin, P. Mindfulness based stress reduction for school-age children.. In: Hayes, SC.; Greco, LA., editors. Acceptance and mindfulness interventions for children adolescents and families. Context Press/New Harbinger; Oakland, CA: 2008. p. 139-161.

Schonert-Reichl KA, Lawlor MS. The effects of a mindfulness-based education program on pre- and early adolescents' well-being and social and emotional competence. Mindfulness. 2010; 1(3):137–151. doi: 10.1007/s12671-010-0011-8.

Skeer M, McCormick MC, Normand ST, Buka SL, Gilman SE. A prospective study of familial conflict, psychological stress, and the development of substance use disorders in adolescence. Drug and Alcohol Dependence. 2009; 104:65–72. [PubMed: 19446409]

Sibinga EMS, Kerrigan D, Stewart M, Johnson K, Magyari T, Ellen JM. Mindfulness-based stress reduction for urban youth. Journal of Alternative and Complementary Medicine. 2011; 17:213–218. [PubMed: 21348798]

Simons-Morton B, Crump A, Haynie DL, Saylor KE, Eitel P, Yu K. Psychosocial, school, and parent factors associated with recent smoking among early-adolescent boys and girls. Preventive Medicine: An International Journal Devoted To Practice And Theory. 1999; 28(2):138–148. doi: 10.1006/pmed.1998.0404.

Sussman S, Dent CW, Lichtman KL. Project EX. Outcomes of a teen smoking cessation program. Addictive Behaviors. 2001; 26:425–438. [PubMed: 11436934]

Tobler NS, Roona MR, Ochshorn P, Marshall DG, Streke AV, Stackpole KM. School-based adolescent drug prevention programs: 1998 meta-analysis. The Journal of Primary Prevention. 2000; 20:275–336.

Twenge JM. The age of anxiety? The birth cohort change in anxiety and neuroticism, 1952-1993. Journal of Personal and Social Psychology. 2000; 79:1007–1021.

Twenge JM. Generational differences in mental health: Are children and adolescents suffering more, or less? American Journal of Orthopsychiatry. 2011; 81(4):469–472. doi:10.1111/j.1939-0025.2011.01115.x. [PubMed: 21977931]

Valiente C, Lemery-Chalfant K, Swanson J, Reiser M. Prediction of children's academic competence from their effortful control, relationships, and classroom participation. Journal of Educational Psychology. 2008; 100(1):67–77. doi:10.1037/0022-0663.100.1.67. [PubMed: 21212831]

van der Oord S, Bögels SM, Peijnenburg D. The effectiveness of mindfulness training for children with ADHD and mindful parenting for their parents. Journal of Child and Family Studies. 2012; 21(1): 139–147. doi:10.1007/s10826-011-9457-0. [PubMed: 22347788]

Wills TA, Ainette MG, Mendoza D, Gibbons FX, Brody G. Self-control, symptomatology, and substance use precursors: Test of a theoretical model in a community sample of 9-year-old children. Psychology of Addictive Behaviors. 2007; 21:205–215. [PubMed: 17563140]

Wills TA, Gibbons FX, Sargent JD, Gerrard M, Lee H, Dal Cin S. Good self-control moderates the effect of mass media on adolescent tobacco and alcohol use: Tests with studies of children and adolescents. Health Psychology. 2010; 29(5):539–549. doi:10.1037/a0020818. [PubMed: 20836609]

Wills TA, Pokhrel P, Morehouse E, Fenster B. Behavioral and emotional regulation and adolescent substance use problems: A test of moderation effects in a dual-process model. Psychology of Addictive Behaviors. 2011; 25(2):279–292. doi:10.1037/a0022870. [PubMed: 21443302]

Wills TA, Sandy JM, Yaeger AM. Moderators of the relation between substance use level and problems: Test of a self-regulation model in middle adolescence. Journal of Abnormal Psychology. 2002; 111:3–21. [PubMed: 11866177]

Wills TA, Walker C, Mendoza D, Ainette MG. Behavioral and emotional self-control: Relations to substance use in samples of middle and high school students. Psychology of Addictive Behaviors. 2006; 20:265–278. [PubMed: 16938064]

Wills TA, Sandy JM, Yaeger AM, Cleary SD, Shinar O. Coping dimensions, life stress, and adolescent substance use: A latent growth analysis. Journal of Abnormal Psychology. 2001; 110:309–323. [PubMed: 11358025]

Wilson N, Battistich V, Syme SL, Boyce WT. Does elementary school alcohol, tobacco, and marijuana use increase middle school risk? Journal of Adolescent Health. 2002; 30:442–447. [PubMed: 12039514]

Zelazo P, Lyons KE. The potential benefits of mindfulness training in early childhood: A developmental social cognitive neuroscience perspective. Child Development Perspectives. 2012; 6(2):154–160. doi:10.1111/j.1750-8606.2012.00241.x.

Table 1

Distribution of child characteristics by study condition

	Intervention	Control	Total
Gender[a]			
Female	58%	58%	58%
Race[b]			
European American	64%	74%	67%
African-American	14%	0%	9%
Other	23%	26%	24%
Ethnicity[c]			
Hispanic	15%	10%	13%

[a] n = 71 (intervention); n = 40 (control)

[b] n = 66 (intervention); n = 38 (control)

[c] n = 66 (intervention); n = 39 (control)

Table 2

Correlations among pre-test variables

Outcomes	1	2	3	4	5	6	7
1. Executive Functioning	-	−.31**	−.18+	−.43***	−.09	.37**	−.13
2. Attention Problems		-	.74***	.57***	.07	−.85***	.22*
3. Aggression Problems			-	.51***	−.05	−.64***	.28**
4. Social Problems				-	.43***	−.48***	.11
5. Anxiety Problems					-	.02	.09
6. Self-control						-	−.28**
7. Intentions to use							-

+ p<.10.

* p<.05.

** p<.01.

*** p<.001.

Table 3

Results from PROC MIXED analyses and adjusted post-test mean scores and standard errors

Measure	Intervention		Control		*df*	*F*	*Effect size*
	Mean	**SE**	**Mean**	**SE**			
Executive Functioning – overall correct	.90	.01	.86	.01	1, 90	7.15**	.42
Social Problems	51.78	.60	53.68	.66	1, 101	4.49*	.41
Aggression Problems	51.54	.36	53.06	.43	1, 101	7.30**	.54
Attention Problems	53.40	.59	54.11	.65	1, 101	.66	.16
Anxiety Problems, condition by gender					1, 99	5.00*	.23
Boys	51.84[a]	.64	50.90[a]	.86			.27
Girls	51.92[a]	.57	54.14[b]	.73			.62
Self Control, condition by gender					1, 99	3.29+	.20
Boys	4.46[a]	.13	4.27[b]	.15			.56
Girls	4.62[a]	.12	4.54[a]	.14			.09
Intentions to Use Alcohol or Tobacco	.16	.03	.12	.04	1, 96	.59	.16

*** p<.001.

Note. Means with different superscript letters are significantly different from one another.

+ p<.10.

* p<.05.

** p<.01.