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The impact of a mindfulness program on preschool children's self-regulation and prosocial skills

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The impact of a preschool mindfulness program on children's self-regulation and prosocial skills

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by

Remi Alyssa Torres

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ABSTRACT OF THE THESIS

The impact of a mindfulness program on

preschool children's self-regulation and prosocial skills

by

Remi Alyssa Torres

Master of Arts in Education

University of California, Los Angeles, 2017

Professor Jennie Katherine Grammer, Chair

Recent investigations on mindfulness training and child outcomes have found positive effects on executive function, social skills and academic performance. The majority of research on mindfulness practices with children has focused on school-age children. To explore the impact of mindfulness training on preschool children's self-regulation and prosocial skills, this investigation utilized a mindfulness-based social skills program randomly assigned to one of two preschool classrooms serving children (3-5 years-old), the second classroom was assigned waitlist-control (treatment as usual). No significant differences were found between the mindfulness-based social skills program and waitlist-control classrooms on measures of self-regulation and pro-social skills. Teachers reported children benefiting from the mindfulness-based social skills program and demonstrated further interest in mindfulness-training for themselves and their students. Results and implications for future directions in research on mindfulness practices for children will be discussed.

The thesis of Remi Alyssa Torres is approved.

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The impact of a mindfulness program on preschool children's self-regulation and prosocial skills

Self-regulation has long been recognized by researchers as a critical skill needed for children's academic success and future outcomes (Morrison, Ponitz, & McClelland, 2010). Research on self-regulation and long-term success has found that children with lower self-regulation are more likely to have negative health and life outcomes, even when considering children's IQ, gender, and socio-economic status (Moffitt et al., 2011). Mindfulness training has become a highly researched strategy to improve self-regulation in adults. John Kabat-Zinn, Phd, the founder of mindfulness-based stress-reduction (MBSR), defines mindfulness as, "Paying attention in a particular way: on purpose, in the present moment, and non-judgmentally" (Kabat-Zinn, 1994, p.4). Investigations on mindfulness have found a host of benefits in adults including improved relationships, improved physical and mental health, and changes at the neural level (Hölzel et al., 2011). As the evidence of the positive impact of mindfulness investigations has increased, researchers have grown interested in applying these techniques to children in classroom settings.

Research on mindfulness training with school-age children has found outcomes such as improved emotion regulation, executive functions, and academic performance. Although there has been growing interest on the impact of mindfulness interventions on preschool age (2-5 years-old) children's self-regulation, much of the research so far has focused on school-age children. To examine the impact of mindfulness training on preschool age children's self-regulation, the effects of a mindfulness-based social skills intervention were explored in two preschools in Los Angeles serving low-income, predominantly Latino preschoolers between age 3 and 5 years old.

Self-Regulation and Academic Achievement

Self-regulation is broad term that encompasses executive functions and emotion regulation. Executive functions (EF) are a set of cognitive skills that include working memory, cognitive flexibility, and inhibitory control (McClelland & Cameron, 2012). Working memory refers to our ability to retain and shift various forms of information during short periods of time. Cognitive flexibility helps us hold or shift attention in response to changing demands or to apply different rules in different contexts. Inhibitory control is the ability to inhibit an inappropriate action. In contrast, emotion regulation refers to the capacity to regulate oneself in the context of an emotionally arousing experience.

Emotion regulation and EF are highly interrelated and work cooperatively. Some researchers have characterized self-regulation by describing the relationship between cognitive and emotion regulation as involving "top-down" and "bottom-up" processes that interact with one another. Top-down processes include EF and bottom-up processes refer to emotion regulation (Blair & Raver, 2012; McClelland, Geldhof, Cameron & Wanless, 2015). Together EF and emotion regulation act to enable children to regulate their attention, emotions, and behavior.

At age three children begin to show variances in working memory, inhibitory control and attention shifting (Hughes, 1998). Between age 3 and 6 years, children dramatically improve their inhibitory control (Montgomery & Koeltzow, 2010) and from age 4 to 6 years children also improve their working memory skills (Davidson, Amso, Anderson & Diamond, 2006). In school, children are required to use several self-regulatory skills such as focusing their attention, controlling their impulses, and recalling multi-step instructions to effectively complete tasks (McClelland et al., 2007). For example, children develop these skills in the classroom as they

attend to their teachers during instruction, engage with peers during outdoor play time, or while patiently (or not so patiently) waiting for lunch to be served.

As children develop stronger self-regulation skills their academic skills also improve (McClelland, Acock, & Morrison, 2006). For instance, children's inhibitory control and working memory have been linked to math and reading performance in kindergarten and first grade (Blair & Razza, 2007). The association between self-regulation development and academic achievement continues to develop past elementary years and beyond (McClelland & Cameron, 2011). However, although these links between self-regulation and academic outcomes have been observed, researchers are still working to understand which aspects of self-regulation are most predictive of future success. Ahmed and colleagues (2018) found that only working memory at 54 months was predictive of working memory and academic achievement at age 15, controlling for early childhood achievement, home and demographic variables. This finding may demonstrate how certain aspects of self-regulation may be more predictive of academic achievement than others yet also reflect the challenges of measuring a complex skill such as self-regulation across development.

Poverty and Self-Regulation

Socioeconomic status (SES) is defined as the status of an individual or group that combines factors of educational attainment, income level and occupation. Evidence suggests that children that come from low socioeconomic backgrounds are more likely to experience stress, violence, and instability, all of which have been shown to hinder optimal development of self-regulation (Blair & Raver, 2012). SES has also been shown to predict differences in children's language, cognitive, academic and social skills prior to entering school (Morrison, Bachman & Connor, 2005).

Children that experience adversity associated with poverty are thought to develop weaker self-regulation due to stress hormones that hinder optimal brain and behavioral development (Blair & Raver, 2012). SES has been related to differences in children's brain structure and function in three brain regions strongly associated with self-regulation including the prefrontal cortex, hippocampus, and amygdala (Brito & Noble, 2014; Hackman & Farah, 2009).

Encouragingly, these trends are not straightforward. Protective factors in a child's environment such as a high-quality school, experienced teachers and safe neighborhoods can serve to strengthen children's self-regulation in the context of poverty (Duncan, McClelland, & Acock, 2017; McClelland et al., 2010). However, regardless of the presence of risk factors such as low SES, children that are better self-regulated have stronger academic achievement than children with lower self-regulation (Sektnan, McClelland, Acock, & Morrison, 2010).

The Need for Explicit Instruction of Self-regulation skills in schools

As children grow older their self-regulation skills improve, though the type and quality of schooling children experience may uniquely contribute to the development of these skills. Despite the large body of research supporting the importance of self-regulation skills, schools often do not often explicitly teach these skills and place a heavier focus on academic performance on standardized tests. Head Start, a federal early childhood program designed to provide comprehensive services to children growing up in poverty, has a predominant pressure to focus on academic skills with increased evaluation pressures (Konold & Pianta, 2005). The pressure to focus on academic skills over socioemotional skills in early childhood centers serving children who may be at-risk for academic delays is a common issue (Konold & Pianta, 2005).

To examine the effects of explicit socioemotional skills instruction on Head Start preschooler's language and literacy, Bierman and colleagues (2008) designed the REDI

(Research-Based Developmentally Informed) curriculum, which has a dual focus on socioemotional skills and academic school readiness. They found that REDI improved children's social-emotional competence. Moreover, as these skills improved, so did their language and emergent literacy skills, compared to children in traditional Head Start classrooms. This study demonstrated that socioemotional instruction has the potential to improve both children's social and academic skills, which together are critical for children's long-term academic success. Mindfulness-based socioemotional instruction may be a more effective format for early childhood centers. Though to begin to understand why adding mindfulness to socioemotional instruction is beneficial, it is essential be familiar with the mindfulness-based intervention research with adults.

Mindfulness-based Interventions with Adults

The prevalence of mindfulness research has focused on mindfulness-based stress reduction (MBSR) interventions with adults. Mindfulness research has found quite a host of beneficial outcomes in adults such as: improved attention regulation and improved mental health and social health by reducing stress, anxiety and depression (Ludwig & Kabat-Zinn, 2008). Much of this research has used neurological methods to examine meditation's effect on the neural correlates of skills related to mindfulness such as self-regulation and self-awareness.

For example, Hölzel et al. (2011) found that an 8-week MBSR training resulted in increased in gray matter concentration in the hippocampus- a region central to the processes of learning, memory, self-awareness and compassion, in meditator's brains compared to controls. In an electroencephalography (EEG) investigation on meditation and executive control (a skill linked to attention regulation), adult meditators outperformed (made fewer errors) controls on a Stroop task. Meditators also showed greater attention to errors, correlated with higher error-

related negativity (ERN) amplitudes and better emotional acceptance of the error as indexed by higher error-related positivity (Pe) (Teper & Inzlicht, 2013). Furthermore, the changes at the neural level have been shown to be long lasting (Lardone et al., 2018), and potentially preventative to age-related brain degeneration diseases such as Alzheimer's disease. These investigations demonstrate the plasticity of the adult brain and the potential for mindfulness training to promote long-term improved mental health and well-being.

Mindfulness-based Interventions with Children

With the promising results from mindfulness training with adults, researchers have become increasingly interested in the potential impact of mindfulness training for young children. It is well demonstrated that early childhood is the developmental period in which the most rapid and critical brain development occurs and also a sensitive period wherein preventative intervention can provide the greatest impact (Nelson, 2000). The extant evidence on the benefits of mindfulness training for adult's well-being and self-regulation highlights the potential for similar, if not greater, benefits for children.

Research in mindfulness training with children is limited, compared to the research done with adults, and much fewer researchers recruit preschool-age samples. Mindfulness interventions for children (under the age twelve) have found similar outcomes observed in adult research, such as improved self-regulation, EF, well-being, and academic performance. As inquiry into mindfulness practices with young children is still nascent, it is difficult to interpret these preliminary results, as many mindfulness interventions lack randomization, control groups, and rely on teacher and student reports. In a systematic review of mindfulness-based interventions in K-12 schools, authors found only nineteen mindfulness-based interventions to have used a controlled design, eight of those interventions were done with children age ten and

younger (Zenner, Hermleben-Kurz, & Walach, 2014). Another challenge to the research is that standardized measures of mindfulness for children are still a work in progress, as is a systematized format to optimally teach children mindfulness. With these limitations in mind, the following review focuses on random-controlled mindfulness-based interventions conducted with children under the age twelve.

In one of the first random and controlled investigations on mindfulness practices with children, researchers developed a twelve-week program on mindful breath awareness and yoga given to 114 1st-3rd graders (Napoli, Krech, & Holley, 2005). They found that teacher reports of children's attention and social skills improved, and direct assessments of children's test anxiety decreased compared to controls. No between group differences in direct assessments of children's sustained attention were identified.

Saltzman and Goldin (2008) conducted an eight-week mindfulness-based stress reduction (MBSR) program where teachers were also trained as mindfulness instructors for 31 nine- to11-year-old children. Analyses found that children participating in the MBSR program had improved attention, reduced emotional reactivity and improved metacognitive skills compared to controls based on self and parent reports.

Two years later, Flook and colleagues (2010) designed an eight-week mindfulness intervention for elementary school children and predicted that those participating in the intervention would gain higher EF skills compared to controls. Although overall group differences were not found in EF, mindfulness training resulted in improved EF among children that began with the lowest levels of EF. Teachers and parents reported overall gains in children's behavioral regulation compared to controls.

Schonert-Reichl and Lawlor (2010) also designed a mindfulness curriculum and measured children's self-reported optimism and positive emotions as well as teacher reports of children's social-emotional competence. The mindfulness curriculum was given to six randomly selected teachers in twelve elementary school classrooms and the other half assigned to waitlist-control. A significant increase was found in intervention children's self-reported optimism and positive emotions. Teachers also reported significant improvement in children's social and emotional competence and decreased aggression and behavioral problems.

In a mindfulness-based yoga intervention for 4th and 5th grade girls, researchers found significant time by group interactions on children's reported levels of coping strategies and stress appraisal. Researchers attributed these findings to previous reports showing that mindfulness training improves the awareness of feelings associated with stress that may then enhance coping strategies to stressful situations (White, 2012).

In sum, previous mindfulness investigations have generally only found significant effects of mindfulness training for children only when the outcome measure is a teacher, parent and/or child report. Past investigations also did not use control group comparisons that received a traditional socioemotional skills intervention without mindfulness, to see if it is the mindfulness-based aspect of the intervention that was uniquely predictive of children's outcomes. Recently, researchers conducting experiments on mindfulness training for children have used stricter experimental designs, narrowed their inquiry by comparing mindfulness training to socioemotional skills training, and employed standardized direct assessments of children's self-regulation. This has allowed researchers to see if mindfulness will uniquely predict gains in children's self-regulation independent of the effects of socioemotional skills training.

For example, Schonert-Reichl and colleagues (2015) predicted a mindfulness-based social and emotional learning (SEL) program for 4th and 5th graders would boost children's cognitive control, promote wellness, pro-sociality and positive academic outcomes. To test this, two classrooms were randomly assigned to receive the mindfulness-based SEL program and the other two classrooms to receive a social responsibility program without mindfulness. Post-intervention, children in the mindfulness-based SEL program showed significant improvements in direct assessments of cognitive control and stress physiology, self-reported well-being and pro-social skills compared to controls. Children in the mindfulness intervention were also reported by peers as more prosocial and socially accepted than the children participating in the social responsibility program without mindfulness.

In an investigation with pre-Kindergarten children, Flook, Goldberg, Pinger and Davidson (2015) conducted a random and controlled twelve-week mindfulness-based intervention using the Kindness Curriculum. Researchers analyzed direct assessments of children's self-regulation, prosocial behaviors, teacher-reports of children's social competence, and school grades. Overall, the intervention classrooms showed greater improvements in prosocial skills, school grades, and small to medium effect sizes of improvements on self-regulation measures compared to the control classroom. Intervention children with lower baseline prosocial and self-regulation skills showed the greatest gains overall.

Razza, Bergen-Cico and Raymond (2015) conducted a mindfulness-based yoga intervention to promote self-regulation for preschool children (3-5 years old). Analyses found that children who participated in the treatment had significantly improved parent evaluations and direct assessments of self-regulation skills (specifically, attention, delay of gratification and inhibitory control). Children who began with lower self-regulation skills benefited the most from

the intervention. This finding- where children who show lower levels of baseline self-regulation tend to gain the most from the mindfulness-based interventions has been found in past research (Flook et al., 2010 & 2015). With these results in mind and the strong evidence from research on the benefits of mindfulness practices for adults, the potential benefits of mindfulness for children, especially those that already struggle with self-regulation skills is much warranted.

The Need for Mindfulness Research with Early Childhood

In combination, these studies reveal the potential benefits of training mindfulness practices to young children. However, it is also clear that there is a need for more rigorous research on the effects of mindfulness training for young children. Moreover, given that much of the work has been conducted with homogeneous groups of children, it is particularly important to understand the benefits of such training for understudied groups. The skills children can learn from mindfulness practices – like a heightened awareness of their emotional state, improving emotion regulation and paying attention – can be taught inexpensively by classroom teachers, but also have the potential to improve performance in school and social life (Diamond, 2002). Economists have found early childhood interventions to be a valuable investment, that in return will result in fewer costly health outcomes and risk-taking behaviors in the future (Heckman, 2011). Considering the potential self-regulation skills have as a protective factor to children's mental health and well-being, mindfulness training is a relatively cost-effective and simple program to implement to promote these skills.

To date, however, very few studies using mindfulness in educational settings use a random-control design and even fewer studies focus on low-income preschoolers. Indeed, in a review of mindfulness research in early childhood, Erwin and Robinson (2016) found only 12 articles matching the criteria, seven of those articles were published after year 2010, showing

that mindfulness practices with preschool children are a burgeoning interest to researchers. Given that early experiences have the potential to shape children's developmental trajectories, the ability to self-regulate at a young age has the potential to positively impact children into adolescence and adulthood (McClelland, Ponitz, Messersmith & Tominey 2010). Low-income children are at higher risk for under developing self-regulation skills and schools can serve as a protective factor to these risks (Moffit et al., 2011; Blair & Raver, 2012). Considering that early childhood is a critical period for developing self-regulation and in establishing lifelong practices, mindfulness-based curriculums may have the potential to strengthen current early childhood programs.

Current Study

In the current investigation, children were randomly assigned to participate in either a mindfulness-based intervention or control lessons (teaching as usual) across eight weeks. In addition, pretest and posttest assessments of children's self-regulation and pro-sociality were collected. To better understand the self-regulation behaviors of children when they were in their classrooms, teacher questionnaires on children's EF and emotion regulation were also collected. Finally, teacher interviews were conducted at pretest with all teachers (before assignment to intervention or control) to gain a qualitative perspective on the teacher's current classroom management and self-regulation teaching strategies, and how teachers perceive mindfulness practices as beneficial to the classroom. At posttest, only teachers that participated in the mindfulness-based intervention were interviewed again to learn about their thoughts on the intervention. Specifically, the aims of this project included:

Aim 1: Examine the impact of the mindfulness program on children's self-regulation skills with direct assessments and teacher reports.

Aim 2: Examine the impact of the mindfulness program on children's pro-social skills.

Aim 3: Explore the teacher's classroom management practices to promote self-regulation through one-on-one interviews

Aim 4: Explore teacher's impressions of the utility of the mindfulness intervention at posttest through one-on-one interviews.

It was predicted that children completing the mindfulness program would have larger improvements in their self-regulation and pro-social skills from pretest to posttest than children in the control condition. Based on previous research indicating that children with baseline lower levels of self-regulation demonstrate the most positive growth, it was also anticipated that the impact of the intervention would be greater for children with lower self-regulation at the beginning of the study. It was also predicted that teachers might have different views on the efficacy of mindfulness in preschool and in strategies to teach children self-regulation, but teachers would find this type of intervention to be a useful and beneficial addition to the preschool program.

Method

Participants

Preschool children (14 girls, 24 boys, M_{age}=3.5, age range: 3-5 years) were recruited from two classrooms within a non-profit early childhood organization in Los Angeles. To be eligible to attend the preschool, families must qualify as low-income defined by the 2016 federal poverty level; for a family of four, income must be lower than $24,250. The ethnic composition of the sample was 97% Latinx* and 3% Black/African American. Information regarding children's language primary language was not collected, though teachers reported that all of children spoke English. Given that the students were predominantly Latinx, and given the demographics of the

community served by the early childhood organization, it is likely that the majority of participating children also spoke Spanish or had exposure to Spanish language at home. Parents were invited to have their children participate in the study through in-person conversations and informational flyers. Table 1 provides demographic information of child participants by experimental assignment.

Teachers were invited to the study through an in-person meeting. The preschool classrooms were randomly assigned to the mindfulness program or waitlist-control group (participation in preschool as usual) by flipping a coin. There were three teachers (one lead and two co-teachers) in each of the preschool classrooms.

In total, seven preschool teachers participated in the investigation. During week 5 of the intervention, one teacher left her position and the teacher that filled her position participated in the post-intervention teacher interview. Across the three teachers in each classroom, the average number of years of teaching experience reported in the experiment classroom was 10.6 years, and in the waitlist-control classroom was 11.3 years. Table 2 details each of the teacher's classroom assignment. The names of each teacher are represented with a pseudonym to protect the teachers' privacy. All of the teachers were of Latinx descent and spoke both English and Spanish, one teacher in the waitlist-control classroom spoke only Spanish.

Procedure

All of the children participated in baseline assessments of self-regulation and pro-sociality before the intervention. The randomly selected experimental classroom received 8-weeks of mindfulness training and the waitlist-control classroom did not receive any mindfulness training. All data were collected within three weeks before and after the intervention.

Mindfulness Intervention. As discussed in the review of mindfulness interventions conducted with children, very little of this research was been pursued with preschool-age children. As such, a challenge to the current study was in developing a preschool-age appropriate mindfulness curriculum. Thanks to the generosity of researchers Lisa Flook, PhD and Susan Kaiser-Greenland, JD an experienced mindfulness educator and author of the book, *Mindful Games* (2016), the curriculum was designed with the advice and resources from experts in mindfulness training for children.

The developmental appropriateness for preschool children was the largest consideration in developing the curriculum. Of great concern, for example, was whether preschool-age children can understand the concept of mindfulness without the advanced cognitive skill of Theory of mind (ToM), a developmental milestone where children begin to understand that others have different mental states, thoughts, and beliefs from their own (Baron-Cohen, 1991). With this consideration in mind, the curriculum minimized activities that would require ToM, and instead emphasized relating mindfulness to more concrete physical actions, such as noticing the five senses- seeing, hearing, feeling, smelling and tasting. Toward the end of the curriculum, the mindfulness instructor lead activities that required aspects of ToM, such as understanding the value of kindness and helpfulness to others.

The mindfulness program consisted of 15-20 minute lessons, offered twice weekly for 8 weeks. The mindfulness instructor, who had several years of experience with meditation and as a preschool teacher, led child-friendly games to increase mindful awareness, emotion regulation and prosocial skills. Activities and books were selected from the following sources: *Mindful Games* (Kaiser-Greenland, 2016), *Kindness Curriculum* (Flook et al., 2015) and from the mindfulness instructor's personal collections of lessons. The curriculum was guided by weekly

themes: 1) Mindful listening, 2) Mindful seeing, 3) Mindful smelling, 4) Mindful movement, 5) Mindful eating, 6) Mindful feelings and emotions, 7) Gratitude, 8) Kindness, see Table 3 for greater details.

The first goal of the mindfulness program was to teach the children mindful awareness, which involves noticing the inner processes of doing, feeling, and thinking and how to recognize them as they arise in the body. Activities included noticing your breath or heartbeat. For example, children were encouraged to recognize the subtle changes experienced when their heartbeat beat faster after running in place compared to taking deep breathes. This information was then expanded to include teaching the children that our bodies also change when ones feels emotionally upset. For example, if you feel angry your heart may beat faster and your face may feel hot.

The second goal of the program was to teach the children self-regulation strategies when feeling emotionally aroused. The mindfulness instructor encouraged the children to notice the physical sensations of various emotions, to label their emotion, i.e. “I’m feeling mad.” and then to seek a regulation strategy. Some of the strategies taught to the children were breathing techniques, help seeking, and self-regulation tools for calming emotions. As part of the mindfulness program we created a “self-regulation station” where children were offered tools to help them label their emotions and find a relevant strategy to help alleviate their emotions. Various emotional pictures were displayed in the self-regulation station, including the emotions happy, sad, angry, and scared. The children were encouraged to label their emotion and then choose a self-regulation tool. The tools we offered were child friendly involving objects that could be manipulated, such as a pinwheel to blow their breath (to practice breathing), a stress

ball to squeeze, a teddy bear to hug, and a glitter bottle (we encouraged the children to shake the bottle and then watch the glitter settle to the bottom while taking breaths).

The third goal of the mindfulness program was to teach children the value of prosocial skills such as sharing, kindness and helping others. As these lessons required perspective taking skills, such as ToM, we offered these lessons toward the end of the program. We used storytelling, puppet enactments of scenarios where one puppet would express empathy or kindness and activities that encouraged children to be grateful and helpful.

Each of the lessons included group games, sensory activities, movement, and book reading. Examples of activities included mindful walking, mindful eating, breathing practices, and discussion about emotions and the physical sensations that accompany different feelings. All mindfulness trainings were video recorded. Classroom teachers were introduced to basic mindfulness practices prior to the 8-week program for one hour and were encouraged to participate in the mindfulness lessons. Teachers were also asked to administer 3 short (2-min) practices with their students at throughout the school day on the days the mindfulness instructor was not present. Children were also asked to practice learned mindful skills in daily life (e.g., in the classroom, on the playground, bus, and at home). See Table 3 for a detailed description of each weekly theme and Table 6 for a sample lesson.

Waitlist Control group. Children in the waitlist control group participated in the classroom activities normally scheduled. These children were to be offered the same intervention following the completion of the initial investigation.

Child Measures

Children were assessed in advance of the intervention and immediately following the intervention. All assessments were conducted by trained undergraduate and graduate researchers

blind to the group assignment of the children. In addition, for measures that required behavioral coding, all coders were blind to the condition of the participating children.

HTKS Task. The Head, Toes, Knees, Shoulders (HTKS) task requires stopping a prepotent response and initiating a new response, while also tapping into working memory and attentional flexibility (McClelland & Cameron, 2012). In the task, children are asked to remember up to four paired rules for behavior (e.g., "Touch your head" or "Touch your toes") and then asked to do the opposite in response to the instructions. For example, when the experimenter says, "Touch your head" a child's correct response would be to do the opposite and touch their toes. The task increases in difficulty as children succeed in the test, requiring children to utilize working memory and attentional flexibility to remember new rules and switch attention from the old rules. Children's performance on HTKS predicts emergent literacy, vocabulary, and math skills between age 3 and 6 years (Cameron Ponitz, McClelland, Matthews & Morrison, 2009). Each item is coded as follows: 0= Incorrect response, 1= Any motion to incorrect response, but self-corrected to end with correct response, 2= Correct response. Performance on the task is indexed through a sum of the first six practice items and the 20 test items, scores range from 0-52.

Gift delay Task. Gift delay is a variation of the delay of gratification task, developed by Mischel and Ebbeson (1970). In this task, the experimenter instructs the child to sit in a chair facing away from them, while the researchers says, "I am going to wrap a gift for you, try not to peek." The researcher then noisily wraps the gift for 60 seconds. The child succeeds in the task if they successfully inhibit the urge to peek during the 60 seconds. This task was employed to measure children's emotion regulation skills such as inhibitory control and self-control. The task was recorded and coded by trained research assistants who reached reliability after double

coding 20% of the videos. Researchers coded for latency to peek over the shoulder. Latency to peek was measured by the number of seconds elapsed before the child peeked or did not peek. Children that did not peek received a score of 60 seconds.

Sharing task. This task consists of four separate trials in which the child distributes stickers between themselves and a target recipient as they wish. The four target recipients included: a most-liked and least-liked peer (identified by the child from a classroom picture), a "stranger" child they have never met, and child that is sick in the hospital (a picture of a child with a thermometer in their mouth laying in a hospital bed). In each of the trials, children were presented with a cup for themselves labeled "me" and a cup with a picture of the designated target recipient. Children were given 10 stickers at the beginning of each trial and told they could keep as many as they would like for themselves and give as many as they would like to the other person. The experimenter turned away from the cups while the child distributed the stickers and turned back around after the child said, "Done!" Scores were summed for each trial along with a score that reflected the total number of stickers shared across all trials.

Teacher Report and Interview

Behavior Rating Inventory of Executive Function Questionnaire-Preschool (BRIEF-P). The BRIEF-P (Gioia, Espy, & Isquith, 2002) is a 63-item questionnaire for parents and teachers of preschool-age children (2 to 5 years), and provides a profile of executive function behaviors in home, school, and social environments. The scales include, Inhibit (16 items), Shift (10 items), Emotional Control (10 items), Working Memory (17 items) and Plan/Organize (10 items). The level of internal agreement within the BRIEF is high (Cronbach's *a*'s) (*a* = .80-.98) and has a high test-retest reliability between parents (*rs* = .82), and teachers (*rs* = .88), (Anderson, Anderson, Jacobs, Northam, & Mickiewicz, 2002). Teachers were asked to rate each

item (e.g., “Child is impulsive”) as to whether it is “never,” “sometimes”, or “often,” an occurrence for the child. Responses to items comprising each scale are summed (never= 1, sometimes= 2, often= 3) and compared with normative values in tables for two age groups (2–3-year-olds and 4–5-year-olds) separately by gender (boys and girls). Individual scores on each scale were summed to create a total Global Executive Composite (GEC) score, higher scores indicating greater difficulty in executive functioning behaviors.

Teacher Interviews: Exploring Teacher’s Views on Self-Regulation and the Utility of Mindfulness Practices with Children. Along with considering changes in children’s performance as a function of the intervention, an additional goal of the project was to explore teachers’ existing strategies for developing children’s self-regulation and their views on the utility of mindfulness in a preschool classroom. This study is the first investigation (that we are aware of, to date) to examine mindfulness practices with a majority sample of Latinx children. Considering the cultural background of the sample, we were interested in the teacher’s thoughts and experiences about mindfulness training.

To address this goal, 15 – 20-minute semi-structured interviews were conducted with all teachers before the intervention. After the intervention, the teachers that participated in the mindfulness program were interviewed again to gather their impressions of the utility of teaching mindfulness to preschoolers. The interviews were semi-structured, with a set of ten prepared questions, though we also explored any themes brought up by the teachers. All of the interviews were conducted by the principal investigator or by a Spanish-speaking research assistant (this interview was conducted with a Spanish speaking-only teacher from the waitlist-control classroom before the intervention).

Pre-intervention Teacher Interview Questions. In advance of the intervention, teachers were asked to describe how they approach teaching self-regulation to their students and detail specific strategies they use in the classroom. Because teaching self-regulation looks differently in group and individual instructional settings, teachers were asked about how they instruct self-regulation in group settings and with an individual child. For example, teachers were asked to describe how they would approach different scenarios such as, "When you see a child having a tantrum, how do you approach them?" and "When you notice the entire class acting disruptive, what do you do?" Table 7 contains the full list of the pre-intervention interview questions.

Post-Intervention Teacher Interview Questions. The teachers that participated in the mindfulness program were invited for a second interview, to reflect and discuss their thoughts on the effectiveness and utility of the mindfulness program. These interviews were 15- to 20-minute semi-structured interviews, with a set of ten prepared open-ended questions, conducted by the principal investigator. Table 7 contains the full list of the post-intervention interview questions.

Data Analysis

Children's pre- and post-experiment data was analyzed with SPSS Statistics 23. At baseline, group differences were examined with a series of independent sample t-tests. Given the exploratory nature of this study, small sample size and small unit size (only two classrooms), we examined group differences as a function of experimental condition with repeated measure ANOVAs (RMANOVA). RMANOVAs were computed for each continuous measure from post-test to pre-test.

Teacher interviews were conducted by the first author and transcribed from audio recordings and analyzed using qualitative thematic analysis under the conceptual framework of Braun and Clark (2006). Using thematic content analysis, the interview data were open coded,

where teacher responses to each of the interview questions were compared and separated into different themes. When teacher responses did not result in an overall theme, each teacher's response was reported. As the teacher interviews were quite short and the interview questions were prepared, thematic analysis provided a flexible inductive approach to the data. The results of the interviews are shared after each prepared interview question. A justification for the interview question is offered and overall themes from teacher responses are discussed.

Results

Sample Descriptive Information

Before examining potential group differences as a function of the intervention, descriptive statistics for each measure were calculated, as shown in Table 4. In Table 5, sample attrition by individual child-level measures are displayed.

Baseline Group Differences as a Function of condition

No significant differences were found at baseline on measures drawn from Gift delay Latency to Peek $t(28)= .31, p> .05$ and number of stickers shared in the Sharing task $t(33)= -.83, p> .05$. In contrast, significant differences were observed between the experimental and control group at baseline on the measures HTKS and BRIEF. The experimental group's mean HTKS score was significantly higher ($M= 15.7, SD= 14$) than that of the control group ($M= 6.7, SD= 6$); $t(29)= 2.2, p= .03$. The experimental group's mean BRIEF score was significantly higher $(M= 104.6, SD= 15)$ than that of the control group's mean score $(M= 79.7, SD= 15); t(31)= 4.6, p< .001$.

As noted previously, the groups varied in the number of boys and girls in each classroom. Given literature suggesting that gender differences in self-regulation exist in this age range, differences in the sample as a function of gender were also examined at the pretest using

independent sample t-tests using gender as a grouping variable. These analyses revealed no significant differences due to gender in any of the measures.

Changes in Performance as a Function of the Intervention

BRIEF-P Teacher Ratings. It was hypothesized that children in the mindfulness program would make greater gains in self-regulation behaviors as measured by the BRIEF. At baseline, the experimental and control group mean total BRIEF scores were significantly different, with the experimental group scoring higher *(M= 104.6, SD= 15)* than the control group *(M= 79.7, SD= 15).* At post-test, the data was analyzed again to reveal no significant differences between groups, with the experimental group scoring *(M= 108.6, SD= 28)* and the control group scoring *(M= 91.7, SD= 24), F(1,31)= 0.64, MSE= 525.1 p> .05.*

Head, Toes, Knees, Shoulders Task. At baseline, HTKS scores were significantly different between the experimental and control group, *t(29)= 2.2, p= .03),* with the experimental group's scores *(M= 15.7, SD= 14)* and the control group's scores *(M= 6.7, SD= 6)*. No significant differences were found from pre-test to post-test by group for HTKS alone, the experimental group's HTKS scores were higher *(M= 13.4, SD= 12)* than that of the control group's HTKS scores *(M= 6.7, SD= 9), F(1, 31)= 0.32, MSE= 43.2, p> .05.*

Gift delay Task. No significant differences were found on latency to peek by group from pre-test to post-test, *F(1, 29)= 0.17, MSE= 136.9, p> .05)*. The experimental group's average latency to peek at post-test *(M= 30.7, SD= 28)* was slightly longer than at baseline *(M= 20, SD= 22)* and the control group's average latency to peek at post-test was also slightly longer *(M= 26, SD= 25)* compared to baseline, *(M= 17.2, SD= 24)*.

Sharing Task. No statistically significant differences were found between groups in number of stickers shared from baseline to post-test, *F(1, 31)= 0.12, MSE= 0.12, p> .05)*. Both

groups showed small increases in sharing stickers at post-test. The experimental group shared *(M= 11, SD= 11)* stickers on average at baseline and at post-test shared *(M= 16.1, SD= 8)* stickers. The control group shared *(M= 14, SD= 7)* stickers at baseline and at post-test shared *(M= 17, SD= 8)* stickers.

Pre-Intervention Interview Results

Before the intervention, teachers that participated in the study were briefly interviewed to gain an understanding of the teacher's philosophy of teaching, the techniques they use to scaffold children's self-regulation skills and how familiar they are with mindfulness techniques.

To you, how do you think children learn best? The teacher interviews started with questions designed to be an invitation for them to provide a sense of their philosophy on how to optimally teach children. It was a question that could also give a sense of the way the classroom and school as a whole center approached teaching and learning in early childhood. Overall, half of the teachers reported that children learn best through play and interaction with their learning environment (three out of six teachers).

In response to the question, "How do you think children learn best?" Teacher Juliana said, *"Children learn best when it's hands on, like they learn like, by doing things, by playing with them, fooling around with the stuff… instead of telling them instructions for everything. When you let the kids explore however they want, that's when they learn and even then, not all children will learn the same way, but each child will (learn) in their own pace."*

The teachers described different aspects they found to be important in teaching children or in the child's future education. Teacher Maria highlighted the importance of getting to know each child and recognizing that each child is unique. *"Even though you look, it's just the same age, sometimes the same background, the same um, sometimes they are family, two brothers or*

two sisters… Sometimes we have them over here and they act totally different. That's why you have to know very, very, well your child, because everybody unique."

Teacher Juana, who had been working at the center for over 10 years emphasized the importance of helping parents advocate for their children's education. *"I think that if we don't make the parents be part of the education of the children, it's going to be more hard for the children and difficult for the education of the children, because look who's making the decisions, it's the government- the adults, but not the children. They didn't decide they are going to have good schools or not- it is others that are making the decisions. I think that if the families are involved in the education they can decide good things for the child, they can fight for the good things…We try to involve the families a lot, I am a very strong believer that parents have the powers to make the difference in the children."*

Teacher's views on teaching self-regulation to an individual child. Teachers were next asked how they approach discipline and teach self-regulation with an individual child. During the preschool age years (2-5 years old), tantrums are a common form of emotional outbreak (Grover, 2008). Caregivers are key in instructing the child how to improve their emotion regulation (Bornstein & Putnick, 2012). This is especially true during emotionally difficult situations, for example, when a child is having a tantrum during parent separation at drop-off. This question sought to gather teacher views on specific strategies or phrases they use to support an individual child's emotion regulation- especially as the techniques used to support an individual child differ from the teacher's techniques to manage a larger group of children.

The most common responses across all teachers were the importance of communicating with the child (talking it out) and re-directing the child's behavior to an appropriate activity. A couple of teachers mentioned *"calming"* the children, though direct examples of what they

meant by "calming" were not given by all teachers. In response to this question when given the example of a child having a tantrum, most teachers reported giving the child space to finish the tantrum and then talking with the child after they have calmed down.

Tantrums. Teacher Isabelle described, *"Essentially try to calm them down, try to calm them, and if they don't get calm then I leave them alone for a bit. Let them do what they are and then once I see them more relaxed then talk to with them. But, always calmly... or I hug them tell them to relax, we will talk and then once I see they are relaxed I start talking to them. That is where I see that being cool and collected is essential because when you yell or speak down to children it is worse, they will act out more. Naturally it is normal to feel anger, it is normal if they want to cry. We tell the kids that 'it is okay, that yes, cry, it is normal, that they can cry, just as they can be happy, they can be mad'."*

Teacher Angela similarly responded, *"Just like redirecting a lot, communicating with them, finding out why they do things the way they do. Um, as far as controlling their emotions, having like little emotional outbursts. I kind of let them cry it out. And then I'll go back, 'Are you ready? You want to talk to me now?' I, I listen to them, I try my best to listen to them."*

Drop-off/Separation from parents. Teacher Maria described a scenario of a child being upset after morning drop-off, *"When mommy left, I let them do what they want, to be on the floor, I let them be on the floor, whatever they want to be. And then I be aware that nothing around them can hurt him or her. And I touch him and I say, 'I love you, I love you, you going to be okay, mommy is going to come back,' and little by little they calm down."*

Teacher Juliana also described what she would do when a child is upset after morning drop-off, *"When their mommies leave, um, well yes we take them away from their parents. They cry and we try to distract them by doing something you know. We tell them oh, 'Follow me. Help*

me with this, I need, I need help,' and they like helping. So, we try to distract when their mom leaves."

Teacher's strategies to teach self-regulation to the entire class. To learn how the teachers manage the entire class, we asked them to share what they do when the all or many of the children seem to behave inappropriately during a group activity like circle time. This question was aimed to better understand the similarities and differences in classroom management strategies teachers used. Studies have shown that children are better able to self-regulate in a classroom that utilizes consistent and routine classroom management strategies. When the classroom environment has a routine schedule and clear expectations, children are better able to regulate their behavior for the expectations of the environment (Pianta, Belsky, Vandergrift, Houts, & Morrison, 2008).

The teachers reported the importance of understanding how much direct-instruction is developmentally appropriate. One teacher said circle time should be no longer than 15 minutes. Another teacher reported changing the activity if the children do not seem engaged. Many of the teachers described using creative strategies for managing the class such as using puppets, silly voices and music to get the children's attention.

Teacher Angela shared a past experience when the whole class became disruptive, *"I wanted each of them to stand up and present the superhero they wore and to demonstrate their specialty, their talent or their gift. And they were all just rowdied up, you know, one would do it and the other one would want to get up and they want to do it and I was like, 'Wait! One at a time!' Not good for 3 year-olds. No, I was like 'No guys, sit down' so I kind of started clapping, I started singing a song, and then like the older ones are like okay it's time to calm down. And so the little, smaller ones would see the older ones so they kind of follow along too. And then um, if*

it doesn't help, I'll stand up and kind of like guide them. You know, so do something like that where I just go 'Hey guys come on, let's start singing!' I use a lot of music with my teaching."

Teacher Maria described the value of acting silly, *"I act, I have to, I act silly. Yes, so when it's like all the children are going around I put a hat on my head, I put my glasses, I put um something on my neck and I say, 'Do you see me? Look! What do I look like? They turn their eyes on me and look at teacher, 'Okay sit down, sit down." Sometimes that works, sometimes not. And sometimes I start singing."*

Teacher Juana insisted on keeping direct-instruction no longer than 15 minutes, *"Just try not to do it for too long, for example the circle time is just 15 minutes, don't get too long, because the children are still too little. Also one thing we use are things like puppets, sometimes I used have things in my work purse over here just to distract them a little bit because the thing we want from them is to stop making noises and listen to you and you need to do really, a lot of things, give different tones to your voice and make something that holds their attention, because when you hold their attention you can just explain, and not to give long explanations, short explanations…"*

Teacher Isabelle emphasized the importance of being aware of the children's engagement in an activity, *"If we are on a certain topic and I can see that it does not engage them, then I try to change the subject. I think that is the best option for them because that is what happens with children, their attention could be shifted if they aren't engaged in what is being worked on."*

Strategies to support children's self-regulation during transitions. Previous research has shown that a marker of a well-managed classroom is efficient transitions between tasks, for example, transitioning from outside play to lunch time (Pianta et al., 2008). A few teachers described some of the strategies they use to make transitions easier between activities.

Teacher Maria described using pretend play during transitions, *"We're gonna say, 'Teacher Juana's group, go to your table, flying like a bird'. Or, 'Teacher Angela's- go to your table, walking like a monkey or doing it like a monkey'. We use those kinds of transitions, sometimes."* Teacher Alma described using instruments and music, *"We usually ring a bell, sometimes we play music. Um, and then, just singing like the 'Clean-up Time' song so they could get re-directed to have a transition."*

Teacher's familiarity with mindfulness. Finally, the teachers were asked if they were familiar with mindfulness and welcomed any questions they had about the subject before the intervention. Across all of the teachers, they reported interest in mindfulness for the children and some teachers reported interest in mindfulness for themselves.

Teacher Alma said, *"I would like to learn more about it, I do, like it sounds like an interesting topic... That'll work, some kids like need it like…and I think it really helps them. And it'll change their way of acting. Maybe."* Teacher Maria said, *"Yes, of course I would like to know how to do so better. In reality we do not know how to do so sometimes regardless of how much experience one may have sometimes there are things we can learn but I do not know what."* Teacher Juana said, *"Well if I learn I would like to try it (mindfulness) too!"* Teacher Angela said, *"I think I would be more open to finding you know different approaches, different strategies on mindfulness, and I'll probably apply it to myself."*

Pre-Intervention Results Conclusion

The goal of the pre-intervention interview was to understand how the teachers were teaching children self-regulation skills, and to learn if the teachers were familiar with mindfulness and/or interested in learning more about it. As the population of the sample was

97% percent Latinx, we considered the possibility that some teachers might have felt apprehensive about mindfulness- as it has roots in Tibetan Buddhism. In fact, the teachers were quite enthusiastic about the mindfulness program and even demonstrated interested in mindfulness training for their own personal use. The teachers also seemed to report using sensitive, supportive and creative approaches to promote the children and entire classroom's self-regulation skills. With their current strategies in mind, we aimed to use the mindfulness program to build upon their existing strategies.

Teacher Interview Results Post-Intervention

After the intervention, the three teachers that participated in the mindfulness program were interviewed again. One of the teachers, Teacher Lili, joined during week 5 of the intervention, therefore it is important to note that she only participated during the last three weeks of the intervention. One of the original intervention teachers, had left the preschool for a new teaching position during week 5 of the intervention. The following interview questions were asked to get an overall sense of the teachers' perception of the mindfulness program, if they found it useful, and to share any anecdotes of the children using the skills they learned from the mindfulness program during the school day.

What did you think of the mindfulness program? Teacher Maria said, *"I liked the program because it taught children how to control their body by themselves, without teacher help, the children (with those strategies you show them) they learn to understand themselves better."*

Teacher Lili who joined the intervention at week 5 said, *"Well I've only been here for quite a little bit so I maybe got just the last of the sessions but the two, three sessions that I saw they were pretty helpful for the kids… because you know, it was the, I guess to describe how*

you're feeling and to the children over to see what they can do, It worked. I did it with two of my kids from my table and with Lupe (pseudonym) and it really helped. She would tell me like 'I'm mad,' and she would constantly repeat it, like if somebody did something to her she would come to me, 'Teacher Lili, I'm mad' and she'll let me know."

Teacher Maria and Lili highlighted the aspects of the mindfulness curriculum that encouraged children to learn to recognize their emotions, label them and communicate them. Teacher Lili specifically mentioned that children used the Relaxation Station, where the children learned to label their emotions and were encouraged to find a strategy to help them regulate their emotions.

Teacher Juliana said, *"It was good, I mean I think sometimes the circle time was a little long with them, but I think they kind of got the concept. Especially when you put the bear and the blanket and the pinwheel in the relaxation station and to tell you which (emotion), how they are feeling, I think that worked out for them."*

Across the three teachers, they generally had positive feedback on the mindfulness program. The teachers seemed to especially appreciate the Relaxation Station, where the children were able to use hands-on tools provided to guide their own self-regulation process and in some cases, independently. One of the teachers mentioned that at times the circle time was too long, which is related to the following question of how developmentally appropriate the mindfulness program was for preschool-age children.

Do you think the mindfulness program was developmentally appropriate for preschool children? The developmental appropriateness of the mindfulness program was of great concern at the time of the study, as a published and research-based mindfulness early

childhood curriculum was not yet available. Mindfulness training can also require some advanced cognitive skills that young preschoolers around 2 to 3 years old may have not yet mastered, such as theory of mind (see page 14 for definition). As Teacher Lili joined the mindfulness program quite late, around Week 5, we have only included the responses from Teacher Maria and Juliana.

Teacher Maria said, *"I think it's right with the, yeah, it was right for the age of them… Some of them doesn't get because when you do some exercise, you ask them something they respond with another answer. Sometimes, maybe they don't get the question that you asked them."*

Teacher Juliana said, *"I think for the younger ones maybe the three-year-olds might not be appropriate, maybe for four and five it would've worked. Especially the ones closer to five, I think they kind of got the concept a little bit more than the younger ones."*

Between Teacher Maria and Julianna, they reported the program being developmentally appropriate for the classroom, though certain aspects of the program seemed better suited for the older children (four years and older) than the younger children. To get to the specific aspects of the program that the teachers found most successful, the following question was asked.

What parts of the curriculum do you think the children enjoyed the most? Teacher Maria said, *"I think all of the things they enjoyed because the activities that you brought for them… like do you remember the rock? The little rock you give it to them. When you pass the smelling things, and when you passed the touching things. Yeah, most of them looked engaged with those activities."* Teacher Juliana said, *"Maybe the participation one when they do like the breathing and the bubble and so when you got them a little more active I think that is when they enjoyed it more."*

Teacher Lili described what activities they used most often in class from the mindfulness program. *"Our mindful bodies and mindful minds, how to hold our hands and everything, catch the bubble, we're still using it because it's really helpful."*

Across the entire mindfulness program, the teachers seemed to point to the activities that involved materials, hands-on exploration and movement as the most engaging for the children. In the beginning of the mindfulness program, we began with sensory activities each week to ease the children into building increased awareness of their senses (e.g. smell, taste, touch), with the ultimate goal of the children having heightened awareness of their emotions.

Did you see any of the children using any of the mindfulness skills from the program or did you see any of them use the Relaxation Station? Teacher Juliana responded, *"The thing I did see them using is the Relaxation Station and role playing and telling other children to have a mindful body or mindful walking or something. They did use the Relaxation Station and they would actually like know, like point at a picture and see how their emotions were. But we did really see a lot of the children using it, especially the older ones."*

Teacher Lili recalled, *"They were doing the mindful, I think it was called tippy toe or something, quiet, quiet, (slow motion transition) they were using that in the beginning a lot."*

Teacher Maria: *"Ok last time was Juan (pseudonym), he was upset and I tried to talk to him but I remember oh we have something over here and then I take him over there (to the Relaxation Station) and then I ask him 'How do you feel? Show me, show me. Are you crying, are you upset? Show me.' And then he pointed to the picture that was crying. 'Oh well I see, how about you use one of those things that maybe's going to help you?' I asked him 'You want to use the bottle, the teddy bear?', and he picked the teddy bear. And I said 'Ok, hold the teddy bear.'*

And he held the teddy bear for a few seconds, and he said 'Ok I feel better' and he put the teddy bear back."

Teacher Maria shared another anecdote, *"When we were outside because we divide it by tables and one of my kids remembered (a mindfulness activity) and said, 'We have to go slow motion, we're gonna go in slow motion inside the classroom' and I said ok and they came in slow motion like you showed them, they remembered. Yeah, they used many strategies that you showed them."*

Overall the teachers seemed to particularly find the Relaxation Station very useful and observed the children using it frequently. As discussed earlier, the teachers reported the activities that involved movement to be especially engaging for the children and relatedly reported that the children would role play *"mindful walking"* which meant to walk very slowly on tippy-toes and we also called a "*slow motion transition*."

Did you gain any interest in practicing mindfulness? On another note, we were also interested in whether the program might have sparked the teacher's interest in mindfulness for personal use. Teacher Maria and Lili reported some interest in mindfulness practices for themselves and even said they used some of the strategies the children learned from the program.

Teacher Maria replied, *"Yeah. It helped me, it helped me. I use it with my son too. I start breathing when I get upset and tell myself, 'ok start breathing'."*

Teacher Lili said, *"Some strategies actually work (for teachers), because sometimes you're busy and you're angry or you're upset… and sometimes you don't even take it into consideration, 'Okay, let me sit down, I need to take a breather.' You're just kind of up and down with the same emotion, so you basically don't have time for yourself. I tried to remember and reflect on what you said, 'Okay I need to take a breather'."*

Post-Intervention Interview Conclusion

Overall, the teachers reported particular aspects of the program as a valuable to the children's self-regulation skills, while also highlighting observed effects of the program that might not have been captured in the child-level measures. For example, the teachers indicated that the children began using more emotion-related language as a result of the intervention. Teacher Lili said, *"Lupe (pseudonym) yesterday stomped her foot on the ground and said, 'I'm angry!'"* And Teacher Maria said, *"…he said he felt sad."* Teachers also remarked that the most successful aspects of the program were the activities that included hands-on play and materials, and that some of the self-regulation teaching strategies they learned from the program were so successful that they planned to continue to use them. A few teachers shared that they personally benefited from the program, remarking that they used some of the mindfulness strategies taught to the children for themselves. In research examining the effects of mindfulness training for teachers, it has been suggested that teachers develop increased sensitivity, patience, and innovativeness when they include mindfulness practices in their classroom instruction (Erwin & Robsinson, 2016). In all, the post-intervention interviews highlighted the positive aspects of the mindfulness program, the ways in which it could be improved and also informed us of potential effects of the program that we had not previously considered.

Discussion

The aims of this investigation were to examine the impact of mindfulness training on preschoolers' self-regulation and pro-social skills, to explore teachers' strategies to promote preschooler's self-regulation skills and gather their views of the utility of mindfulness practices with preschool children after the intervention. Measures of preschoolers' self-regulation and pro-social skills did not yield statistically significant differences in tests of group by time interaction.

However, based on our exploratory look of teachers' views on the utility of mindfulness practices, the teachers reported finding value and benefits in mindfulness training for preschool children.

Given that very little research has examined the effect of mindfulness practices with preschool children, there are several areas for further investigation in this field of study. Mindfulness research in educational settings is still an emerging field of inquiry and many questions remain concerning the appropriate delivery of a mindfulness intervention. Hence, the potential limitations and confounding factors of the implementation of the mindfulness program, and selected child-level measures will also be discussed. As the sample was of low-income, primarily Latinx children, unique challenges to conducting research with this population will also be discussed. Finally, suggestions for future investigations in mindfulness practices with preschool children will be offered.

Limitations

Sample Attrition and Measurement Attrition. One significant limitation of this investigation was the sample size. As this was an exploratory investigation, the scope of data collection was relatively small. The number of participating children was determined by the number of children enrolled in each classroom. Conducting standardized assessments can also be challenging with young children. Some of the children did not comply with certain assessments, a few children became ill or were absent during data collection and two children were unfortunately expelled by the school from the intervention group. These factors resulted in greater data loss than anticipated. Due to these factors, sample attrition severely limited the statistical power of this study to examine the main effect of the intervention.

Teacher turnover also had an impact on the data collected. Over the course of the study, both lead teachers swapped experiment and waitlist-control classrooms after baseline assessments, though before the beginning of the intervention. The swap of the two lead teachers was a decision made by the preschool director and unrelated to the study. Furthermore, an assistant teacher from both the experiment and waitlist-control classroom left their positions before post-test assessments and were replaced with new teachers. Considering how significant a change in a primary caregiver is in a child's life, both classrooms may have experienced significant challenges in transitioning to new teachers that could have hindered the effects of the intervention. When a new teacher joins a classroom, both the new teacher and child undergo a period of learning and change. These challenges in turn, may have influenced the children's behavior in the classroom, their self-regulation skills, and likely the children with greater self-regulation needs (Hale-Jinks, Knopf & Kemple, 2006).

Teacher-turnover is unfortunately common in early childhood settings (Helburn, 1995). In addition to implications for children's experiences in their classrooms, this posed a challenge in analyzing the teacher report questionnaire of children's self-regulatory behaviors, the BRIEF-P. A significant number of children's BRIEF-P questionnaires ended up being completed by two different teachers or by a new teacher that was relatively unfamiliar with the child. Consequently, the results of the BRIEF-P were challenging to interpret, as the teachers may have held different views of the child or had different experiences with the child.

Developing a Developmentally-Appropriate Mindfulness Curriculum. As outlined in the review of the literature, few studies have examined mindfulness practices with preschool children and fewer have taken place in schools serving low-income children. With this in mind, designing a mindfulness intervention for preschool children proved to be a challenge. At the time

of the intervention, a validated and reliable published mindfulness curriculum was not available for preschool children. To create the mindfulness curriculum, we sought the advice and expertise of researchers and educators who have conducted mindfulness interventions with children such as Lisa Flook, PhD and Susan Kaiser Greenland, JD. Susan Kaiser Greenland, JD was the mindfulness educator in Flook's 2015 random-controlled investigation on mindfulness practices on children's self-regulation skills and has published a book titled *Mindful Games*. These mindfulness curricula were designed for school-age children between 4 and 8 years old.

In contrast, the sample in this investigation included children as young as 2.9 years old, the median age being 3.53 years. Keeping the young age of our sample in mind, we designed the mindfulness program to be appropriate for preschoolers yet with a similar framework of delivery as past mindfulness interventions with older children. Moreover, little is known of the appropriate dosage needed in mindfulness interventions and of the best approaches to teaching mindfulness to preschoolers. The dosage commonly used in past school mindfulness interventions, has been between 6 and 12 weeks of mindfulness training twice a week, adding up to 12-24 total trainings. Generally, it is thought that the higher the dosage the better, though as outside researchers visiting the schools and keeping in mind how busy teachers are, we attempted to deliver the mindfulness program as frequently as possible, without overbearing on the teachers' copious workloads.

Although the majority of the curriculum involved developmentally appropriate activities, the final lessons in the intervention may have required advanced cognitive skills including theory of mind (Baron-Cohen, 1991). This cognitive skill may have not yet fully developed in all of the preschoolers, especially the younger children in the sample. As the more cognitively advanced lessons were delivered soon before the post-intervention assessments, they may have been too

difficult for the children to understand and make an impact on the self-regulation and pro-social skills post-assessments.

During teacher interviews some teachers expressed concern about the youngest children understanding the mindfulness lessons. However, the teachers also provided insight into the types of activities that might be the most successful for working with such young children. Specifically, they highlighted those activities that incorporated more hands-on materials and movement. Another teacher mentioned wanting the lessons to be a little longer. Ultimately, the intervention may have been too short and not developmentally appropriate for children under the age 3 to have made a measurable impact on the youngest children's self-regulation.

The measures used in this investigation did not examine emotion-related vocabulary and focused more on the children's ability to regulate their behavior and prosocial skills via direct assessments. Considering how much the mindfulness program focused on labeling emotions, we may have missed an opportunity to examine the children's emerging emotion-related vocabulary. The Relaxation Station itself was not measured in its effectiveness, such as how frequently it was used and if the children used it appropriately. As many teachers reported children using and benefiting from the Relaxation Station, it may have been a missed area for examination of the skills the children learned from the mindfulness program.

Future Directions and Conclusion

Despite these limitations and challenges, encouragingly, teachers reported children benefiting from mindfulness training and finding the training useful for preschool children. Past investigations on mindfulness training with children have found promising outcomes: improved executive functions, self-esteem and prosocial skills (Flook et al., 2015; Schonert-Reichl et al., 2015) critical skills for future academic and mental well-being (Moffit et al., 2010). In light of

this, there is still more to be learned about the appropriate dosage and delivery of mindfulness practices in school settings, especially in low-income settings. Further research in mindfulness practices with low-income preschoolers is needed to examine whether the use of developmentally appropriate and evidence-based mindfulness curriculum is effective with young children. Based on teacher reports, it is possible that the optimal format of mindfulness training may also be stronger if the teacher's received the training rather than the children.

Although further work is needed to gain a stronger understanding of the impact of mindfulness training on preschooler's self-regulation skills, in this study the teachers reported mindfulness training for preschool children as useful and beneficial. This study also portrayed the challenges in conducting research with preschool children in educational settings. With this in mind, future researchers conducting investigations in these settings should consider novel forms of data collection and try to be as little of a burden as possible to teachers. Along with these suggestions, researchers should also consider that the nature of a preschool classroom commonly includes teacher turnover. Although these are challenges educational researchers must overcome, the benefits of increased research to promote preschool children's self-regulation most certainly outweigh the cost.

Table 1. *Summary of demographic information by condition*

Characteristic	Mindfulness	Wait-list Control	Total
Participants (n)	23	19	42
Mean Age	3.52	3.53	3.53
Gender			
Female	6	11	17
Male	17	8	23
Race/Ethnicity			
Black	0	1	1
*Latinx	23	19	36

*Latinx is used as an alternative to Latino/a and Latin@ because it is gender-neutral and inclusive of all Latin American descendants (Ramirez & Blay, 2016).

Table 2. *Teacher pseudonyms by condition*

Teacher Pseudonym*	Pre-Intervention Classroom	Post-Intervention Classroom
1 Juana	Experiment	Wait-list Control
2 Angela	Experiment	Left classroom
3 Maria	Experiment	Experiment
4 Juliana	Wait-list Control	Experiment
5 Isabelle	Wait-list Control	Wait-list Control
6 Alma	Wait-list Control	Left classroom
7 Lili	-	Experiment

Note. H.S.= high school, A.A.= Associates Degree, B.A.= Bachelor of Arts degree.
*Pseudonyms are used to protect teacher's privacy.

Table 3. *Mindfulness Program: Weekly themes and sample activities*

Weekly Themes	Activity
Introduction: What is Mindfulness?	Introduction to mindful breathing with the bell and belly breathing with pet rock
Observing our Senses: Mindful Listening	Guess that sound & Freeze dance game
Observing our Senses: Mindful Seeing	Find the Tiny Star & Dance like Your Friend game
Observing our Senses: Mindful Feeling & Smelling	Feeling different objects & Guess the Scent
Observing our Senses: Mindful Movement & Tasting	Noticing our Heartbeat and Breath during different exercises, and mindful eating
Emotions: Observing & Calming our Emotions	"Guess the Emotion," and introduction to the Relaxation Station, Puppet stories
Compassion: The Value of Kindness	Puppet stories about kindness and loving-kindness breathing activity
Compassion: Gratitude and Helpfulness	What are you grateful for? Discussion and puppet stories about helpfulness
*Classroom Support: Relaxation Station	A center where children were encouraged to identify their emotion and choose a regulation strategy with the help of a child friendly tools. For example, if a child identified that they were feeling angry by pointing to the angry photograph on the board, they could choose take breaths with a pinwheel where you exhale to make the pinwheel spin or shake a glitter bottle and watch the glitter settle to the bottom while taking deep breaths.

*The Relaxation Station was a center built in the classroom during week 6 of the intervention to be used by the children as they wished, the mindfulness program instructed and encouraged the children to use it, though it was not central to a weekly theme.

Table 4. *Performance on measures and One-way ANOVA results between groups as a function of the intervention.*

	Mindfulness Program				Wait-list Control						
	Pre-test		Post-test		Pre-test		Post-test				
Measure	*n*	*M(SD)*	*n*	*M (SD)*	*n*	*M (SD)*	*n*	*M (SD)*	*df*	*F-value*	*p-value*
BRIEF	19	104.6(15)	19	108.6(28)	14	79.7(15)	14	91.7(24)	(1,32)	3.1	0.88
HTKS	15	15.7(14)	15	13.4(12)	16	6.7(6)	15	6.7(9)	(1,29)	2.7	0.11
Gift Delay	13	20(22)	13	30.7(28)	17	17.2(24)	17	26(25)	(1,29)	.51	0.47
Stickers Task	17	11(11)	16	16.1(8)	18	14(7)	18	17(8)	(1,33)	.07	0.78

Note. n= sample size. BRIEF= Behavioral Rating Inventory of Executive Function. HTKS= Head, Toes, Knees, Shoulders total test and practice trial score. Gift delay= latency to peek. Stickers Task= number of stickers shared. $p < .05$.

Table 5. *Total attrition from baseline to post-test by measure*

Total participants at baseline (n)	Measure	Pre-test	Post-test	Total participants at post-test
42	BRIEF	33	33	34
	HTKS	31	30	
	Gift Delay	30	30	
	Sharing Task	35	34	

Note. n= number. BRIEF= Behavioral Rating Inventory of Executive Function. HTKS= Head, Toes, Knees, Shoulders total test and practice trial score. Gift delay= latency to peek. Stickers Task= number of stickers shared.

Table 6. *Sample Mindfulness Lesson*

Activity	Description
Mindful listening to the bell & breathing exercise	The mindfulness instructor rang the singing bowl and children sat in their "mindful bodies" (seated in a comfortable position with hands in lap). After listening to the bell, the instructor lead the children through 2-3 different breathing exercises. For example, a "bubble breath" where you hold your arms above your shoulders (like a bubble) and pretend to inflate the bubble as you inhale and then pretend to pop the bubble as you exhale.
Activity: "Guess that Sound?" game	The instructor displays 5 different identical containers, each containing an object that makes a unique sound. The children guess each sound without seeing what's inside. After the children guess the sounds, they match the sounds with a second container with the same sound.
Wiggle break: Freeze dance game	Children are encouraged to stand up and carefully listen to music that may be quiet, soft music, or louder, energizing music, when the music stops you must freeze!
Closing: Mindful listening to the bell & breathing exercise	The mindfulness instructor leads the children through the same exercises as the opening, toward the middle of the intervention, the instructor invited a child to ring the bell.

Table 7. *Teacher Interview Protocol*

Pre-Intervention Questions	1. What makes teaching meaningful to you? 2. What strategies do you use to teach children to self-regulate (sit criss-cross during circle time, handle transitions, social problems) in the classroom? 3. If you see a child is having trouble with controlling their body or emotions, what would you normally do? 4. When the classroom seems "out of control" or the children seem overly active what strategies do you use to calm the students? 5. Do you have any experience in mindfulness practices?
Post-Intervention Questions	1. What did you think of the mindfulness program? 2. Do you think the mindfulness program was developmentally appropriate? 3. What parts of the curriculum do you think the children enjoyed the most? 4. Did you see any of the children using any of the mindfulness skills from the program or did you see any of them use the 'Relaxation station'? 5. Did you gain any interest in practicing mindfulness?

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