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Children's responses to peer conflict are important for the development of positive peer relationships and are an indication of children's overall level of social competence. Past research has shown that children with lower levels of executive function (EF) are more likely to choose aggressive responses to peer conflict (e.g., Caporaso, Marcovitch, & Boseovski, 2016) and this may be because of a shared underlying mechanism (i.e., reflection) between social competence and EF. Mindfulness training has been proposed as a way to increase EF in children and adults by training reflection and reducing the experience of negative emotions and it was hypothesized that it could promote competent responses to peer conflict.

A brief version of mindfulness training and a taxing version of the training without the guided mindfulness directions were used to examine the effect these trainings had on responses to peer conflict. Mindfulness training did not produce an increase in competent responding. Low income participants in the Taxing condition selected fewer competent responses to peer situations compared to the Mindfulness and Control conditions. These results are discussed in the context of EF and emotion. Implications regarding reflection as a shared underlying mechanism between EF and social competence are also discussed.

THE USE OF MINDFULNESS TRAINING TO EXAMINE THE ROLE OF EXECUTIVE FUNCTION IN PRESCHOOL PEER CONFLICT

by

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CHAPTER I

INTRODUCTION

Preschool is a time in children's lives characterized by greater opportunities for increasingly sophisticated social interactions (Raikes, Virmani, Thompson, & Hatton, 2013). Although many of these interactions may be positive, peer conflict is a normative occurrence in the preschool classroom (Raikes et al., 2013). Peer entry (i.e., seeking to play with a peer or peer group) and provocation (e.g., a peer taking away a toy) are two common types of peer conflict in preschool classrooms (Denham, Way, Kalb, Warren-Khot, & Bassett, 2013; Dodge & Price, 1994). Children must navigate these situations in a way that meets their personal goals and desired outcomes while still maintaining positive relationships with the other children involved in the situation. How children respond to these types of conflicts is an indication of their overall level of social competence and can affect later social development (Denham & Bouril, 1994; Dodge, Pettit, McClaskey, Brown, & Gottman, 1986; Landry, Smith, & Swank, 2010; McQuade, Murray-Close, Shoulberg, & Hoza, 2013).

Although many preschool children are able to resolve peer conflict without the use of verbal or physical aggression, aggressive episodes are not entirely uncommon during the preschool years for typically developing children (Carbonneau, Boivin, Brendgen, Nagin, & Tremblay, 2016; Persson, 2005; Westlund, Horowitz, Ljungberg, & Jansson, 2008). Westlund et al. documented 893 peer conflict episodes over a nine year

period and found that acts of aggression in response to the conflict happened 25-35% of the time, depending on age and sex. More generally, Carbonneau et al. conducted a largescale longitudinal study with 2,045 preschool children and outlined three distinct groups based on the occurrence of aggression between 1.5 and 5 years of age. They found that 31.5% of children exhibited either none or very low numbers of aggressive episodes, 52.5% exhibited a moderate but decreasing number of aggressive episodes, and 16% exhibited consistently high numbers of aggressive episodes. Because the modal group of children was the moderate group, Carbonneau et al. speculated that aggression observed in preschool may be part of a pattern of normal misbehavior.

Despite the supposed normalcy of aggression during preschool, preschool may be a particularly important developmental period for aggression. Aggressive behaviors associated with later social difficulties begins during the preschool years (Broidy et al., 2003), as does the start of reciprocated friendships (Gershman & Hayes, 1993). Children who respond to a peer conflict in an aggressive manner may be viewed unfavorably by their peers, may not be invited to engage in further social interactions with their peers, and are often regarded as less popular than their more prosocial peers on sociometric measures (Crick, 1996; Dodge & Coie, 1987; Dodge et al., 2003). The lack of peer acceptance may hurt the formation of friendships and deprive these children of rich social environments that are needed for the continued development of social skills (Dodge et al., 2003; Lansford et al., 2006). Because of these negative consequences, it is important to understand what differentiates the non-aggressive from the aggressive responders to peer conflict and the extent to which these differences are malleable.

Executive Function

Executive function (EF) is one potential factor that could facilitate competent responses to peer conflict. EF is the conscious control of thought, action, and emotion needed for goal-oriented behaviors (Zelazo & Carlson, 2012). EF is one of the primary constructs studied under the rubric of self-regulation (Calkins & Marcovitch, 2010; Zhou, Chen, & Main, 2012). According to some researchers (e.g., Miyake et al., 2000), EF consists of three separate but related components: (a) working memory, the ability to hold and manipulate information, (b) response inhibition, the ability to suppress an old response, and (c) cognitive flexibility, the ability to shift from an old response to a new response. Because children must navigate peer conflict in a way to meet their social goals, responses to peer conflict likely rely on the components of conscious control. Children may need to use these skills when faced with peer conflict to gather relevant information from the situation and then use that information to plan and execute competent responses (Landry et al., 2010).

Previous research has demonstrated that EF is associated with overall social competence (e.g., Hughes, White, Sharpen, & Dunn, 2000; Kochanska & Knaack, 2003; McQuade et al., 2013; Nigg, Quamma, Greenberg, & Kusche, 1998; Razza & Blair, 2009) and specifically responding to peer conflict (Caporaso, Marcovitch, & Boseovski, 2016; Denham et al., 2014). For example, Denham et al. (2014) provided preschool children with six peer conflict scenarios (social and physical provocation) and asked them to choose which type of response they would enact from a choice of four actions characterized as prosocial, inept, passive, or aggressive. The results of this study revealed

that an aggregate EF score (i.e., scores from Tower Building, Pencil Tap, and Balance Beam) significantly contributed to response choice variance on the peer conflict measure and predicted both choosing a prosocial response and choosing an aggressive response. Using the same peer conflict measure, Caporaso et al. similarly found that working memory, response inhibition, and cognitive flexibility were all associated with choosing a competent (i.e., prosocial or avoidant) response to peer conflict.

EF and social competence in peer conflict situations may be related because they share a common underlying mechanism– reflection. Reflection refers to the ability to engage in thought about representations, a conscious construction of a mental image (Zelazo, 2004). A series of representation-based EF theories put forth by Zelazo and colleagues postulate that representation and reflection work in tandem to support the development of EF (e.g., Marcovitch & Zelazo, 2009; Zelazo, 2004; Zelazo, Müller, Frye, & Marcovitch, 2003). Taken together, these theories suggest that children become better at cognitively controlling their behavior because of increases in the volume of information children can actively hold and reflect on in the conscious mind.

Although traditionally applied to explain the age-related improvements on tasks that require children to overcome a habitual or conflicting behavioral response to act in a novel way, it is possible these same mechanisms support a variety of social behaviors, including social competence. Richardson, Killen, and Mulvey (2012) were the first to apply the principals of representation and reflection to the social domain, specifically Social Domain Theory. Richardson et al. suggested that when children are presented with non-prototypical social situations, they must use EF to represent and reflect on the

situation in an effort to make accurate social judgements. For example, if children are told that hitting causes pleasure (Zelazo, Helwig, & Lau, 1996), they need to use working memory to consider how their previous knowledge from different social domains (moral, societal, and psychological) fits with the non-prototypical scenario, inhibit the response for the prototypical scenario, and switch to the response for the non-prototypical scenario to make an appropriate social judgement.

Responses to peer conflict may require a similar degree of reflection. The Response Evaluation and Decision (RED) model (Fontaine & Dodge, 2006) differentiates the cognitive processes behind aggressive reactions to provocation from those of planned aggressive behavior. The RED model postulates that aggressive reactions are habit-based and not preceded by an evaluative process that determines if the intended response is aligned with social goals and rules. Aggressive reactions are often impulsive and acted upon without any thought of the possible consequences or alternative response options. Although some children are likely to engage in positive social responses by habit, acting on an impulse is particularly detrimental for those children with a compulsion towards aggressive responding. Although Fontaine and Dodge (2006) do not use the term "reflection" to describe the evaluative process, it is possible that the ability to engage in these evaluative processes is associated with reflective ability in EF.

Preschool is an important timeframe to examine the shared underlying mechanisms that support EF and responses to peer conflict. As mentioned, children begin to form reciprocal friendships during preschool (Gershman & Hayes, 1993) and aggressive tendencies would likely interfere with forming these foundational friendships

(Crick, 1996; Dodge & Coie, 1987; Dodge et al., 2003). EF is also particularly salient during the preschool years because of noted development that takes place between 3 and 6 years of age (Carlson, 2005) and age-related improvements in peer conflict resolution are attributed to this development (Caporaso et al., 2016). EF abilities may be trainable during this time of rapid growth (e.g., Diamond & Lee, 2011). If children with poor EF are susceptible to aggressive peer conflict responses and later social difficulties, strengthening EF skills during preschool may alleviate later social problems for these children. One potential avenue for training is to target reflection processes through mindfulness training.

Mindfulness Training

Mindfulness is characterized by monitoring and observing one's own external and internal experiences (i.e., thoughts and feelings) in the current moment without placing judgement on these experiences (Kabat-Zinn, 2003). A major aspect of mindfulness is the promotion of the self-regulation skills needed to control attention so that the mind stays focused on current experiences (Bishop et al., 2004). Mindfulness can be trained through a series of exercises and practices, many of which have been adapted for preschool and elementary school children. Mindfulness exercises center on activities that focus attention to the current moment and encourage redirection when lapses in attention occur (Flook et al., 2010; Zelazo & Lyons, 2012). Some mindfulness exercises, particularly those designed for children, include a series of guided directions that assist individuals with directing or redirecting their attention. Common exercises for children include deep breathing exercises with attention directed to stomach movements (e.g., Flook et al.,

2010), body scans that direct attention to individual parts of their bodies (e.g., Napoli, Krech, & Holley, 2005), and mindful listening to a meditation bell (e.g., Boguszewski & Lillard, 2015).

Mindfulness training has been hypothesized to strengthen EF in both children and adults because it enhances the top-down processing needed for reflection through the practice and exercise of reflective processes (Zelazo & Lyons, 2011, 2012). Behavioral evidence supports the notion that mindfulness training has a positive effect on EF in both adults and children (e.g., Black & Fernando, 2013; Chiesa, Calati, & Serretti, 2011; Johnson, Forston, Gunnar, & Zelazo, 2011; Schonert-Reichl et al., 2015; Zeidan, Johnson, Diamond, David, & Goolkaisen, 2010). Flook et al. (2010) administered a mindfulness training program to elementary school children twice a week for eight weeks. Teachers and parents completed an EF questionnaire prior to and immediately following training. Children with low baseline EF ratings showed the greatest improvement after completion of training and these improvements were seen across home and school settings. Boguszewski and Lillard (2015) found that one session of mindfulness training had an immediate increased effect on preschooler's performance on two response inhibition tasks (Head Toe Knees Shoulders and the Hand Game), suggesting that even brief exposures of mindfulness training can produce short-term gains in EF.

Mindfulness training not only affects EF, but can also have an effect on children's social behavior. Napoli et al. (2005) used a 12 session, twice a month mindfulness training program targeted to increase attentional capacity and reduce stress in elementary

school children. They found that students who participated in the mindfulness training program received higher teacher ratings for attention, had higher performance on a selective attention measure, and self-reported lower levels of test anxiety. They also found that these children had higher ratings of teacher-reported social skills. Flook, Goldberg, Pinger, and Davidson (2015) specifically targeted social skills through implementation of a mindfulness-based "kindness curriculum" in preschool classrooms. The goal of their program was to promote EF, emotion regulation, and kindness practices such as empathy and sharing. Children who participated in the program twice a week in a twelve week period showed greater improvement on teacher-rated social competence, sharing, cognitive flexibility, and delay of gratification. Again, the greatest gains were seen in children with initial poorer pre-test performance on all measures.

Emotional processes in EF and peer conflict. Standard mindfulness training programs not only exercise top-down EF processes, they also target the bottom-up processes that control stress and emotion (Zelazo & Lyons, 2012). Mindfulness training promotes feelings of calmness, relaxation, and a psychological distance from emotion-laden situations (Zelazo & Lyons, 2012). Research conducted with adults suggested that participants who completed mindfulness training performed better on cognitive tasks with negative emotion stimuli and had lower levels of skin conductance in response to such stimuli (Ortner, Kilner, & Zelazo, 2007). Another study found that exposure to eight weeks of mindfulness training produced a decrease in self-reported negative affect immediately following the training, as well as four months after the training (Davidson et al., 2003). In addition, EEG data with the mindfulness training group showed greater

neural activation patterns that are associated with positive affect immediately following and four months after training.

The inclusion of emotion processes in mindfulness training is important because of the effect emotion can have on cognitive control. The optimal balance model of self-regulation (Blair & Dennis, 2010; Blair & Urasche, 2011) contends that emotional experience can either promote or hinder EF depending on the strength of the emotion. Research on the influence of emotion on EF shows that negative emotions can have a detrimental effect on EF. For example, children who experience sadness show worse performance on delay of gratification tasks (Moore, Clyburn, & Underwood, 1976) and are more susceptible to the temptation of playing with a forbidden toy (Fry, 1975). In addition, children show greater response inhibition deficits on emotional go/no go tasks in the context of sad and angry (Tottenham, Hare, & Casey, 2011) or fearful (Schel & Crone, 2013) faces compared to happy or neutral faces.

The association between emotion and EF is particularly relevant in the context of peer conflict, as peer conflict often elicits negative emotions in the victim (Denham et al., 2013; Denham et al., 2014). In general, emotional experiences before, during, and after a peer conflict situation exert influence on responses to peer conflict (Lermerise & Arsenio, 2000). Children who say they would feel angry in response to peer conflict situations are more likely to also endorse aggressive responses to the conflict (Denham et al., 2013; Denham et al., 2014). These results are interpreted within Orobio de Castro's (2004) dual-processing model, which theorizes that feelings of anger cue a quick, emotional response that is more likely to be aggressive than a slower, more thoughtful response.

Orobio de Castro refers to the slower, thoughtful response as the “reflective route” (p. 94), and states that following this route is dependent on the strength of the emotional experience in comparison to a child’s level of cognitive control (i.e., EF). In this regard, the influence that mindfulness training has on both emotional and EF processes could facilitate socially competent responses to peer conflict. By strengthening reflective processes and modulating the experience of negative emotions, mindfulness training helps ensure that negative emotional experiences do not overcome the EF skills that are potentially needed during peer conflict situations.

Cognitively and Emotionally Taxing Situations

The activities that focus attention to the current moment are the cornerstone of mindfulness training. However, without the use of the guided instructions that are used to direct attention, many of these mindfulness activities could tax cognitive and emotional processes in children. The tasks used in mindfulness training would be quite monotonous without the guided directions to focus attention on a particular aspect of the task. Cognitive resources would be required to inhibit any desires to stop or interrupt the tasks and to ensure continued engagement in the tasks. For example, a common mindfulness exercise requires children to wait five minutes to eat a desired snack while they contemplate the perceptual characteristics of the snack. Without being told to think about the perceptual characteristics, this task would closely resemble common EF tasks that require children to wait for a desired snack or object (e.g., delayed snack or delayed gift; Garon, Bryson, & Smith, 2008) and would require cognitive control to complete.

I am particularly interested in these directionless mindfulness tasks (henceforth known as “taxing training”) and the effect they may have on children’s abilities to respond to peer conflict. Preschool children are often required to complete tasks that use cognitive resources and are not enjoyable, such as sitting still while listening to their teacher during circle time or being required to wait for dessert after dinner. After completing such tasks, do children experience a decrease in cognitive resources or in mood that could affect how they respond to later social interactions? If mindfulness training gives a boost to EF and positive affect, perhaps the same tasks without the mindfulness components would have the opposite effect on children.

Past research with adults has found that tasks that require cognitive control affect performance on subsequent tasks that also require cognitive control (e.g. Baumeister, Bratslavsky, Muraven & Tice, 1998) and can limit the ability to inhibit undesirable behavior, including aggression (Stucke & Baumeister, 2006). A few studies have found similar results with children. For example, Guzenhauser and von Suchodoletz (2014) conducted an emotion suppression study in which preschool children watched an emotional film clip and one group was told that they could not show how they were feeling while watching the clip. The children who had to suppress their emotional displays while watching the film clip had lower self-control scores on a directed attention and concentration task. They concluded that emotion suppression contributed to cognitive resource depletion that affected their performance on the directed attention task and suggested that preschoolers likely face other sources of depletion when asked to focus on activities or adhere to classroom rules.

Pnevmatikos and Trikkaliotis (2013) conducted a series of similar emotion suppression studies in which they induced feelings of frustration in school-aged children by setting up a scenario in which a teacher did not meet the expectations of the child. They hypothesized that children would have to use cognitive resources to inhibit the expression of frustration because the study was conducted in a school and displays of frustration are inappropriate in such a context. Indeed, children who experienced frustration had decreased scores on post-test Go/NoGo and anti-saccade tasks. The results of this study provide further evidence of a limited cognitive control resource but also provide support for the alternative view that mood could affect performance on EF tasks. The authors suggested that frustration is more likely to lead to EF interference than other negative emotions, such as anxiety.

It is particularly important to consider this alternative view of mood because of recent evidence that challenges the idea that cognitive control is a limited resource in adults (for review, see Carter, Kofler, Foster, & McCullough, 2015). Similar to many other suppression tasks, taxing training may also elicit a decrease in positive emotion due to frustration or boredom. As previously discussed, negative emotion can have an adverse effect on both EF (e.g., Blair & Dennis, 2010; Blair & Urasche, 2011) and peer conflict resolution (e.g., Orobio de Castro, 2004). The feelings-as-information theory (Forgas & Eich, 2013; Schwarz & Clore, 1988) provides an additional explanation for why negative emotions could affect later social interactions. The feelings-as-information theory states that individuals often misattribute their emotional state to current external situations. If children are already in a negative mood prior to peer conflict, they could attribute

continued negative feelings to the peer conflict itself and react based on that mood. Lemerise and Arsenio (2000) further suggested that mood colors children's perception of their current social situations and affects the type of information gathered from the situation. For example, negative moods could lead to greater instances of hostile attribution because children perceive more mood-congruent information than what is currently present in the social situation. In addition, negative feelings can prime negative reactions to later social situations (Forgas & Eich, 2013). Because of this, it is important to understand the extent to which possible negative mood induction could have on children's responses to peer conflict.

The Current Study

The current study was designed to examine the effect of mindfulness and taxing training on EF and responses to peer conflict on 5-year-old children to consider reflection as an underlying mechanism of both EF and social competence in peer conflict. It is important to examine the effects of the trainings in this age group because of the previously mentioned importance of social competence in preschool peer relationships and the development of EF during this time. Younger preschool children were not included in this study because of concerns with their ability to complete and understand all of the tasks. The use of mindfulness training and taxing training provided an experimental manipulation of the likelihood children will engage in reflective processes. Both mindfulness and taxing training were included because I did not specifically target populations with known EF and social competence deficits (e.g., children with ADHD) for the sample. As mindfulness training has the greatest effect on children with these

deficits (Flook et al., 2010; Flook et al., 2015), the use of a Taxing condition provides an additional way to produce the desired changes in a high-functioning sample. A time-matched Control condition was also included to isolate the effects of the mindfulness and taxing trainings. Although the Control condition contained many of the same elements as the Mindfulness and Taxing conditions, it had a slightly different procedure to ensure that the participants were not intentionally trained or taxed.

The brief, one time mindfulness training procedure from Boguszewski and Lillard (2015) was used in the current study because it was found to affect response inhibition scores and could be easily modified to create the taxing training. In addition, the taxing training tasks and mindfulness training tasks needed to be matched in length and it did not seem feasible to subject participants to taxing training multiple times in a week or month. To assess the effect of these trainings on emotion, participants selected their current mood from a Likert scale ranging from “very happy” to “very angry” before and after the training session. A child-friendly version of the Erikson flanker task (Erikson & Erikson, 1974; Rueda et al., 2004) was chosen as a measure of EF because it is characterized as a measure of response inhibition and attentional control (Zelazo et al., 2013). Response inhibition measures, in particular, appear to be sensitive to both mindfulness training (e.g., Boguszewski & Lillard, 2015; Johnson et al., 2011; Schonert-Reichl et al., 2015) and mood manipulations (e.g., Fry, 1975; Moore et al., 1976; Pnevmatikos & Trikkaliotis, 2013). A parent questionnaire was also used to gain information on the frequency of aggression in the sample.

To measure responses to peer conflict, participants we asked how they would respond to a series of electronically presented social scenarios. The procedure for the Challenging Situations Task (Denham et al., 2013) used by Denham et al. (2014) and Caporaso et al. (2016) was adapted as a virtual computer game for the current study. The Challenging Situations Task presents participants with six conflict situations that happen to an illustrated third party character. Participants are asked how they would respond if the situation happened to them and are given four forced-choice response options to choose from. The four response options are presented in picture form and include the following: (a) say something to the perpetrator to directly address the situation (prosocial), (b) remove self from the situation (passive), (c) hit, push, or yell at the perpetrator (aggressive), and (d) cry (inept). In the original Challenging Situations Task, the victim in the scenarios is sex-matched to the participants, but the perpetrator is always a boy.

The Challenging Situations Task was adapted as a computer game so it could include a precise measure of response times. In addition, the social situations framed as an interactive computer game placed the participants as the targets of the social situations as opposed to third party observers. This may have made the situations more pertinent to the participants and elicited stronger emotional reactions. The computer game version sex-matched the perpetrator so that both the perpetrator and the victim in the conflict situations matched the sex of the participants. The aggressive response option in the computer game version was separated into two different response options – a verbal aggression option and physical aggression – and the inept response option was excluded

in the computer game. The exclusion of the inept response option was due to the lack of endorsement of this option in Caporaso et al. (2016). The prosocial and passive (termed "avoidant" for the purposes of the current study) response options remained the same as those used in the original Challenging Situations Task.

I was primarily interested in the effect that mindfulness and taxing training will have on responses to peer conflict. It is hypothesized that participants in the Taxing condition will endorse fewer competent responses to peer conflict compared to participants in the Mindfulness and Control condition while those in the Mindfulness condition will choose the highest number of competent responses. Biological sex could potentially interact with the response choice main effect because previous research has shown that boys are more likely to endorse aggressive response choices than girls (e.g., Broidy et al., 2003; Crick & Dodge, 1994; Rose & Rudolph, 2006; Westlund et al., 2008). As suggested earlier, mindfulness training is the most effective for children who exhibit deficits in the outcome measures prior to training (Flook et al., 2010; Flook et al., 2015) so it is possible that boys will benefit more from mindfulness training than girls.

In accordance with the RED model (Fontaine & Dodge, 2006), response times to peer conflict should also differ by training condition. Participants in the Mindfulness condition will take longer to respond to the conflict because they are more likely to engage in reflective processes when faced with a peer conflict situation. Participants in the Taxing condition will take less time to respond, which would suggest that they lack the cognitive and emotional resources to engage in reflection. In addition, endorsed aggressive responses will have shorter response times than endorsed competent

responses, thus providing further support to the RED model and Orobio de Castro's (2004) dual-processing model as both of these models suggest that aggressive responses are quickly enacted without thought or evaluation. In comparison, slower response times would potentially indicate that children actively think about their responses before they choose them.

I hypothesized that the differences in responses to peer conflict produced by the training conditions would be due to differences in mood and EF created by the different conditions. Specifically, I predict that the Mindfulness condition will have the highest post-training emotion ratings, followed by the Control condition, while the Taxing condition will have the lowest post-training emotion ratings. The Mindfulness condition will also have the highest scores on the flanker task, followed by the Control condition, and the Taxing condition will have the lowest flanker task scores. This pattern of results would suggest that the likelihood to engage in reflection was successfully manipulated and provide evidence for reflection as the shared underlying mechanism between EF and responses to peer conflict

CHAPTER II

METHOD

Participants

One hundred and fourteen 5-year-old children, 50% girls, participated in this study (range = 60-72 months, M = 64.41, SD = 3.54). The sample size was determined by a power analysis using G*Power to assess the number of participants needed to conduct a one way ANOVA with a medium-large effect size (d=0.3) at power β=.80. The majority of the children were White (61%), followed by African American (21%), Multi-Racial (6%), and Asian (<1%). Six percent of the sample identified as being Hispanic ethnicity. Eleven percent of the sample did not report their racial identity and 12% did not report their ethnicity. Of the families who reported annual household income (n = 97), 27% reported earning less than $40,000 a year, 37% reported earning $40,000-$90,000 a year, and 36% reported earning over $90,000 a year. Participants were recruited through a participant database for which parents in a midsized Southeastern city voluntarily sign-up their children for participation in research studies. The majority of the parents signed-up their children through local preschools and many of these children were tested in their preschool facilities.

Design

The current study was a between-subject design with three levels of reflection training: a Control condition, a Taxing condition, and a Mindfulness condition. The participants were randomly assigned to a training condition such that sex was equated across all three conditions.

Materials and Procedure

General procedure. Participants completed a pre-training emotion assessment, underwent training, completed a post-training emotion assessment and then completed both a virtual school game task and the fish version of the Erikson flanker task (Erikson & Erikson, 1974; Reuda et al., 2004). The order of the virtual school game and the flanker task was counterbalanced across participants. Following the virtual school game, participants were given a box of small toys to play with for three minutes to alleviate any negative feelings obtained from the game. Parents completed a brief questionnaire about their children's aggressive behaviors outside of the lab and their psychological diagnosis history while their children participated in the study.

Emotion assessment. The participants completed the emotion assessment before and after the training period. Participants were asked to point to the emotion that indicated how they felt "at that moment" from a scale of five sex-matched faces that were obtained from the NimStim Face Stimulus Set (Tottenham et al., 2009). Each face was verbally labeled by the experimenter for each participant. The emotions were scored as on a scale from "5 = very happy" to "1 = very angry" (see Figure 1).

Figure 1

Emotion Scale Used for Girl Participants

Reflection manipulation conditions. ***Mindfulness training condition.*** In the Mindfulness condition, participants completed a series of four contemplative practices that were used in a previous study done by Boguszewski and Lillard (2015). The first task was the gummy bear task during which the participants were told that they will have a snack but it will be a slow snack. Participants who had food allergies or said they did not like gummy bears were given the option to complete the task with a raisin (n = 3).

The participants were guided through a series of questions about how the gummy bear looked, felt, and tasted. In the first phase, the participants were instructed to first look at, and then hold the gummy bear while answering questions about the gummy bear's perceptual characteristics for three minutes. In the second phase the participants were told to put the gummy bear in their mouth but not to chew it while answering the questions for one minute. The gummy bear was placed on a coffee stirrer and the participants were instructed to hold the stirrer like a lollipop to alleviate a potential choking hazard and prevent accidental inhalation. In the third and final phase, the

participants were instructed to chew, but not swallow, the gummy bear while answering questions for one minute. At the end of third phase, the participants were told that they can swallow the gummy bear.

Following the gummy bear task, the participants completed the line walking task. They were instructed to walk in a circle around a taped outline of a circle on the floor and were told to concentrate on putting one foot directly in front of the other so that the heel of the front foot touched the toe of the back foot. The experimenter demonstrated how to walk in this manner for each participant. After the demonstration, the experimenter told the participants to walk around the circle while thinking about how it feels to put weight on the foot during each step. The participants walked around the circle for two minutes. If the participants started to walk too fast or stopped walking, the experimenter reminded the participants to walk slowly and put one foot directly in front of the other.

The third mindfulness training task was the tummy breath task. The participants were instructed to lie on their backs on a yoga mat. The participants were told to put a stuffed animal on their stomach while lying on the mat and were instructed to pay attention to the stuffed animal moving up and down while breathing. The participants were told to breathe slowly in and out while watching how the stuffed animal moved up and down with each breath. The participants completed this task for two minutes and were prompted to continue to watch the stuffed animal if they stopped paying attention to their breaths.

The final mindfulness training task was mindful listening. In this task, the experimenter played a meditation bell sound. The participants were told the sound will be

loud at first and then get quieter. The participants were told to close their eyes, listen to the bell sound, and to raise their hand when they could no longer hear the sound. Participants completed this exercise for two minutes and were reminded as needed to keep their eyes closed and to raise their hand when they could no longer hear the sound (see Appendix A for complete Mindfulness procedure).

Taxing training condition. The Taxing condition was closely modeled after the mindfulness training tasks but did not include the verbal prompts that encouraged reflection (e.g., asking participants to pay attention to the stuffed animal rising and falling with their breaths). Participants completed the four tasks used in the mindfulness training condition for equal amounts of time. Instead of giving the verbal reflection prompts used in the mindfulness training condition, the experimenter repeated the directions of each task. The repetition of directions occurred at the same frequency that the experimenter gave the verbal reflection prompts in the Mindfulness condition. This assured that the participants were spoken to the same number of times in both the Taxing and Mindfulness conditions.

Participants began the Taxing condition with the line walking task. They were instructed to walk around the outlined circle “for exercise” and were told not to walk too fast so they would not get dizzy. The participants completed this task for two minutes and were reminded as needed to reduce their speed. In place of the tummy breath task, participants were instructed to lie down on the yoga mat and hold the stuffed animal “for rest time” for two minutes. Participants were reminded as needed to lie quietly on the mat. For the third task, participants completed the mindful listening task but were only

told to sit quietly while the bell sound played for two minutes. Finally, participants completed the gummy bear task used in the mindfulness condition but again, were not asked any of the questions that were used to focus attention and encourage reflection in mindfulness training. Participants sat and watched the snack on the napkin for minutes and then held the snack in their hand for a total of three minutes. Participants were asked to put the snack in their mouth but not chew for one minute and then asked to chew but not swallow for one minute (see Appendix B for complete Taxing procedure).

The gummy bear snack in particular emulated EF tasks that require the inhibition of a desired response, such as snack and gift delay (e.g., Garon et al., 2008), which may have made this task more difficult than the other three. The gummy bear task was the last task that participants completed in the Taxing condition because it was potentially the most salient. I decided not to change the order of the mindfulness training procedure to match that of the taxing training, as the order for mindfulness training was pre-established by Boguszewski and Lillard (2015) and it is possible that this order was crucial to producing the observed mindfulness effects in their study. Participants who failed the gummy task and ate the gummy bear before completion of the task (n = 9) continued with the study and were included in data analyses because evidence from adult literature suggests that participants that fail to control their behavior still show signs of depleted resources on subsequent tasks (Gunzenhauser & von Suchodoletz, 2014).

Control condition. The Control condition was also modeled after the Mindfulness condition, but instead of having participants complete the tasks without guided directions, they either did not complete the full task or were given toys to play with during the tasks.

The participants began the Control condition with a walking task but instead of walking about a circle for two minutes, the participants were told they were going to go for a walk with the experimenter "to stretch their legs and get some exercise". The experimenter guided the participants around rooms and hallways for two minutes and then returned to the testing space. Participants were then given a box of small toys to play with while they sat with the stuffed animal on a yoga mat for two minutes and then listened to the meditation bell for two minutes. Following the meditation bell, participants were given a gummy bear as a small snack but they did not have to wait and eat it. Instead, participants continued to play with the toys for five minutes until the training condition ended. The Control condition lasted the same amount of time as both the Taxing and Mindfulness conditions and contained the same components (i.e., walking, lying on a yoga mat, listening to the meditation bell, and eating a gummy bear) but the participants were not trained or taxed in any intended way (see Appendix C for complete Control procedure).

The virtual school game. The virtual school game (VSG) used six conflict situations from the Challenging Situations Task (Denham et al., 2013) – Version A. The six conflict situations consisted of three physical provocation scenarios (i.e., knocking over a block tower, taking away a toy, and pushing) and three social provocation scenarios (i.e., peer rejection, being laughed at, being called a bad name). Three benign situations were added so participants did not constantly face negative situations during their virtual day at school and consisted of a peer that asked the target child to play, a peer that offered the target child a pencil, and a peer that waved hello to the target child.

The VSG was presented on a touchscreen Asus laptop computer using E-Prime software (Psychology Software Tools, Version 2.0) and was comprised of pictures of the social situations that were created using ToonDoo (Jambav, 2012), a web-based comic program. Responses were selected using a Cedrus Corporation Model RB-834 Response Pad. The experimenter selected the responses on the pad based on the response option the participant pointed to on the screen.

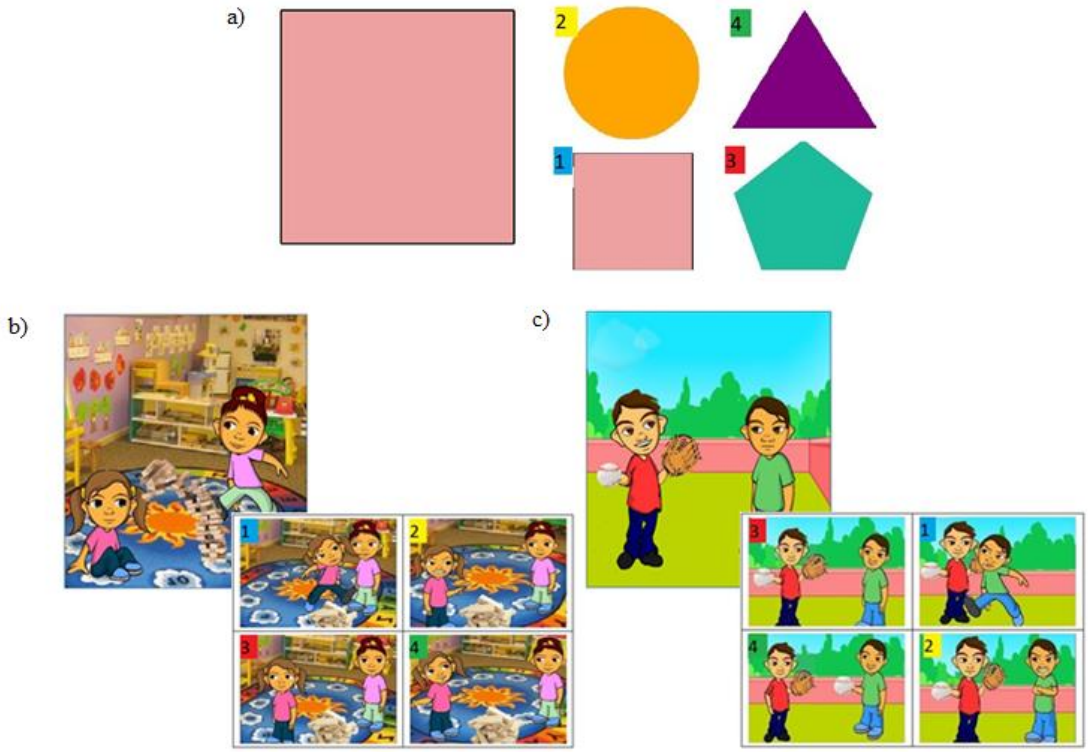
Participants were told that they were going to play a game on the computer during which they will get to go to school with other real children their age who were also playing the game in their homes or daycares. The participants were told that they will get to choose what they wanted to do at school with these children. The task began with four practice trials to orient participants to the directions of the game. During the practice trials, participants were presented with a target shape on the first screen. On the next screen, participants were asked to point to the correct shape from an array of four shapes but only after they heard the experimenter label all the four shapes and click the mouse (see Figure 2 for an example practice trial). The response timer began after the experimenter clicked the mouse while on the second screen. Because the laptop was a touchscreen laptop, it was important for the participants not to point to the screen and accidentally start the timer too early. Participants were corrected if they pointed to their response option prior to the mouse click.

The VSG began following the practice sessions. Participants first selected from a cartoon girl or boy character and were told they would be this character during the game. Then the participants were presented with the nine situations, one at a time, in a

randomized order. Participants saw a pictorial depiction of a situation while the experimenter read a brief description of the situation. The experimenter asked the participants “what do you want to do next” and proceeded to a second screen that presented the participant with the four response options in a 2x2 grid. The experimenter pointed to and labeled each response option starting from the top left quadrant moving left to right, top to bottom (see Figure 2 for example situations and response screens). Each response option was assigned a number and a color that corresponded to the buttons on the Cedrus response pad. For example, all physically aggressive responses had a small blue square in the upper left corner with a number “1” in the square. The response options were presented in a random order but the number and color assigned to each response type remained the same. After labeling all the response options, the experimenter asked the participant “what do you want to do next” for a second time and clicked the mouse to begin the response timer. Participants pointed to the response they wanted to choose and the experimenter immediately pressed the corresponding button on the response pad.

Figure 2

Example Practice and Scenario Screens with Corresponding Response Screens for the VSG



Notes. a) Example practice screen with a corresponding response screen, b) example conflict scenario (i.e., peer knocking over target child's block tower) screen for girls with a corresponding response screen, c) example benign scenario (i.e. peer asking the target child to play with him) screen for boys and a corresponding response screen

After they viewed all nine situations, participants were presented with two catch trials to ensure they did not endorse a response option because they preferred the color or number assigned to that preference. The catch trials were the same as the practice trials;

the participants saw a shape on one screen and were asked to point that the same shape on a second screen from an array of four shapes. All of the participants correctly answered the catch trials. At the end of the VSG, participants were given a debriefing statement to inform them that the children in the game were not real and a brief explanation about why they were asked to play the game.

Flanker task. Participants completed 32 trials of the fish version of the Erikson flanker task (Erikson & Erikson, 1974; Rueda et al., 2004). The task was presented on a touchscreen Asus laptop computer and participants responded using a Cedrus Corporation Model RB-834 Response Pad. The response pad had two arrow buttons pointing in opposite direction. The response pad was positioned directly in front of the participants and was centered with the laptop screen. The flanker task was programed using E-Prime software (Psychology Software Tools, Version 2.0) and modeled off of the procedures used by the National Institute of Health (NIH) Toolbox Cognition Battery (Zelazo et al., 2013) and McDermott, Perez-Edgar, and Fox (2007).

Participants were given a brief introduction to the game, and then completed a minimum of four practice trials. If participants did not get all practice trials correct, they repeated the practice trials until all four trials were answered correctly within a block of practice. Following the practice trials, participants completed 32 test trials (see Figure 3).

The administration instructions used by the NIH Toolbox Cognition Battery (Zelazo et al., 2013) were used during the introduction phase of the task. Prior to beginning the practice trials, participants were given a series of instructions that included a reminder to keep their eyes on a fixation star, answer as fast as they can without making

a mistake, and to continue going after a mistake is made. Participants were also told to press the buttons using just their dominant hand to avoid participants resting a hand on each of the arrows. The fixation star was a blue star in the center of the screen and was presented for 800 ms. Congruent trials showed the fish all facing the same direction. Incongruent trials showed the middle fish facing a different direction than the others. Each of these trial types could show a fish pointing in the right or the left direction, thus creating a total of four distinct types of trials. Participants had unlimited time to answer the practice trials. Participants saw all four trial types during the practice session– left congruent, left incongruent, right congruent, right incongruent.

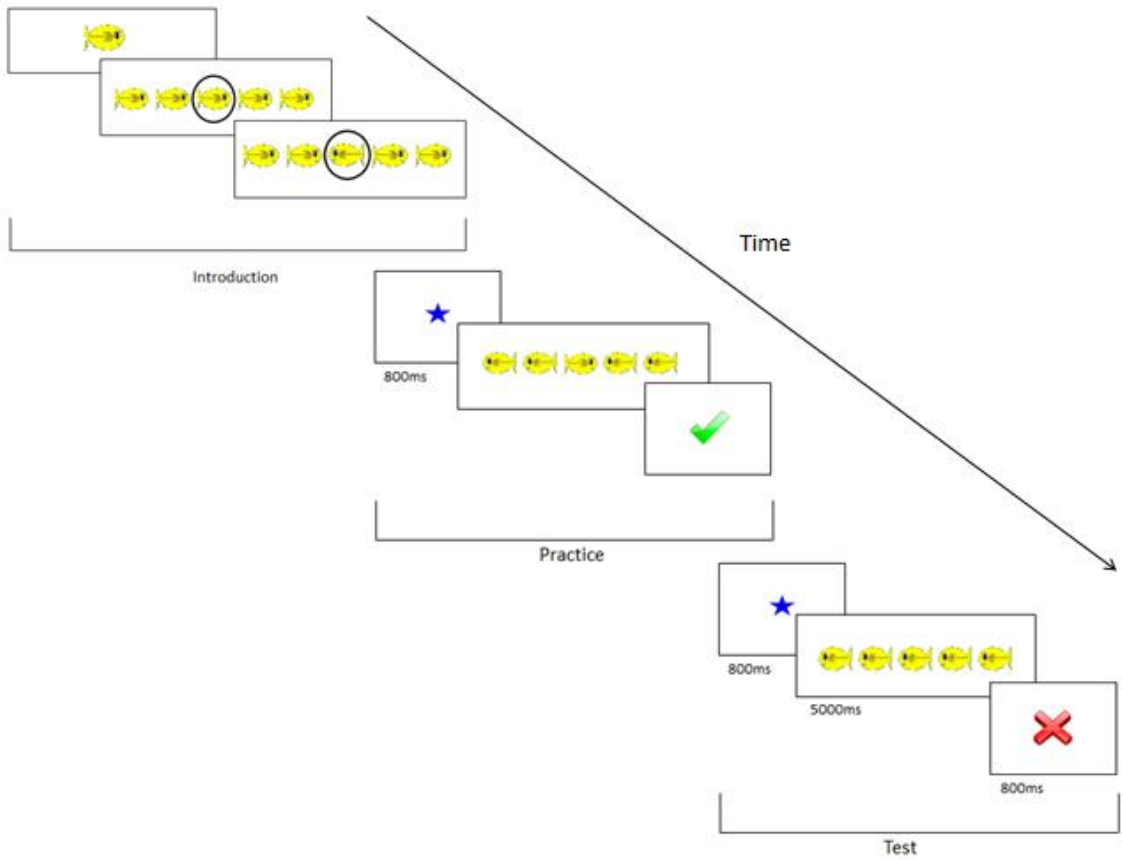
After each practice trial, participants received visual and verbal feedback. If participants answered the trial incorrectly, they saw a red X and were told “remember, you want to press the button that shows where the middle fish is pointing”. If participants answered the trial correctly, they saw a green checkmark. If the trial was their first incongruent correct trial, participants were told “that’s correct, that was the way the middle fish was swimming”. After all additional correct trials, participants were told “that’s right, good job”. The repetition of the rule for the first correct incongruent trial ensured that all participants heard a repetition of the flanker task rule at least once during the practice trials.

Before beginning the 32 test trials, the experimenter repeated the directions used prior to the practice trials. The test trials contained eight of each trial type (e.g., left congruent) and were presented at a randomized order. The participants had 5000 ms to answer each trial. If participants failed to answer within 5000 ms they were shown a

feedback screen that said “no response detected” before moving on to the next trial. After two times of failing to answer within the time frame, the experimenter reminded the participants to “answer as fast as you can”. Visual feedback (i.e., green checkmark or red X) was provided after every trial for 800ms.

Figure 3

Timeline of the Flanker Task



Note. The practice trial pictured is the right incongruent trial type and right arrow was pressed, leading to a correct answer. The test trial pictured is the left congruent trial type and the right arrow was pressed, leading to an incorrect answer.

Participants who took more than three sessions to pass the practice trials were excluded from data analysis. The flanker task was scored following the procedure outlined by Zelazo et al. (2013). The total number of correct responses were multiplied by .125 and added to log-transformed median response times to create a composite score for all participants who correctly answered 80% or more trials. Scores for participants who correctly answered fewer than 80% of the trials were solely reflected by their transformed correctness scores. Trials with a response time under 200ms were indicative of participants either failing to release the button on the response pad after the previous trial or pressing the button without viewing the trial presented on the screen. These were removed.

Parent questionnaire. Parents filled out a brief, six item questionnaire designed for this study. The first three questions were about the frequency of their child's aggressive behaviors with peers that they have either observed or have been notified about from a teacher or another parent. These questions were answered by a five point Likert scale ranging from "never" to "very often". The first question specifically asked parents how often they have observed their children reacting in an aggressive manner to non-family peer conflict. The other two questions asked about how often parents are notified about general aggressive behavior from their children's teachers or other parents.

The remaining three questions asked about their child's psychological disorder history and were primarily posed as yes/no questions. The questionnaire specifically asked about ADHD diagnosis status, as children with ADHD are shown to exhibit a higher numbers of aggressive behaviors (e.g., Becker, Luebbe, Stoppelbein, Greening, &

Fite, 2012; Murray-Close et al., 2010) and lower EF (e.g., Geurts, Verté, Oosterlaan, Roeyers, & Sergeant, 2004; Kerns, McInerney, & Wilde, 2001; Nigg, 2001) than undiagnosed children, but also asked parents to list any additional psychological diagnosis. Appendix D lists the entirety of the parent questionnaire.

CHAPTER III

RESULTS

Missing and Excluded Data

Out of the 114 total participants, $n = 6$ participants were missing parent questionnaires, $n = 1$ participant was missing post-training emotion data, and $n = 1$ participant was missing flanker data. These variables were dealt with in the following analyses using pairwise deletion.

Five participants that were missing income data were considered lower income based on their enrollment in the NC Pre-K program, a government-subsidized preschool program for families with substantial financial need. The remaining $n = 12$ missing income data was addressed by the hot-decking technique (Myers, 2011). Major analyses were run with and without the hot-decking technique. The overall pattern of results remained the same but the income X condition interaction in the 3 X 2 X 2 ANOVA became significant due to power. In addition, the hot-decking technique assigned participants to each income category in an unbiased manner, with participants being assigned to both the lower and higher income groups.

Finally, one participant was excluded from analyses because her median response time in the VSG was beyond three standard deviations above the mean ($z = 5.41$), indicating a lack of understanding of the VSG directions.

Preliminary Results

There were no effects of order. Participants who completed the flanker task first did not differ from those who completed the VSG first on flanker performance, t (107) = 0.414, p = .679, on competent responses chosen on the VSG, t (111) = 1.211, p = .228, or on VSG response time, t (111) = 0.750, p = .455. The first three items on the parent questionnaire were all significantly correlated with one another: $r_{q1,q2}$ (108) = .605, p < .001, $r_{q1,q3}$ (109) = .513, p < .001, $r_{q2,q3}$ (108) = .614, p < .001. An aggregate score was created to reflect parent-rated aggression by summing the standardized scores for the first three questions. The frequencies of responses for the first three questions are reported in Table 1. The remaining three questions of the parent questionnaire asked about ADHD and other mental health diagnoses. According to the answers on these questions, n = 1 participant had a current ADHD diagnosis, n = 1 participants were in the diagnostic process for ADHD, and n = 1 participant had another diagnosis (adjustment disorder, and this participant was the same participant who was in the diagnostic process for ADHD).

Table 1

Frequencies of the Responses for the First Three Questions of the Parent Questionnaire

Question 1: Aggression Observed by Parent			Question 2: Aggression Reported by Teacher			Question 3: Aggression Reported by Another Parent		
Response	*N*	Percent	Response	*N*	Percent	Response	*n*	Percent
Never	23	21.1%	Never	69	63.9%	Never	79	75.5%
Rarely	47	43.1%	Rarely	21	19.4%	Rarely	24	22%
Sometimes	28	25.7%	Sometimes	14	13.0%	Sometimes	6	5.5%
Often	8	7.3%	Often	4	3.7%	Often	0	0
Very Often	3	2.8%	Very Often	0	0%	Very Often	0	0

Descriptive Results

Descriptive statistics by condition and sex are reported in Table 1. It is worth noting that the "competent responses" variable aggregates over benign and conflict situations and includes both avoidant and prosocial responses. Correlations between demographic information and the dependent variables are presented in Table 2. Of note, annual household income and competent responses on the VSG were significantly correlated $r(114) = .286$, $p = .002$. The association between these two variables warranted the inclusion of income in the primary analyses. Income was dichotomized by creating a "lower income" group, annual household income that is less than $40,000 or enrollment in NC Pre-K, and a "higher income" group, annual household income of over $40,000. This allowed for income to be included in analyses using ANOVA. The $40,000 cut-off was chosen because the annual income category of "$25,000-$40,000" on the demographic survey represents incomes that are 75% below the median income in North Carolina for families of three or less (North Carolina Pre-Kindergarten Program Requirements and Guidance, 2016).

Table 2

Means and Standard Deviations for Dependent Variables (range in parentheses) by Condition and Sex

Condition	Sex	2nd Emotion (1-5)	Competent Responses (0-9)	Flanker Composite (1.75-7.44)	VSG RT (ms)	Aggressive RT (ms)	Competent RT (ms)
Mindfulness	Boys	3.94 (1.08)	6.95 (2.61)	.6.69 (0.93)	1865 (754)	1803 (455)	1906 (860)
	Girls	4.11 (0.81)	8.42 (1.07)	6.50 (1.40)	2270 (1550)	2312 (1433)	2318 (1658)
Taxing	Boys	3.90 (1.24)	6.00 (3.32)	6.40 (1.27)	2011 (936)	2018 (880)	2040 (1069)
	Girls	3.68 (1.29)	7.74 (2.26)	6.39 (1.46)	1739 (885)	2920 (2249)	1659 (719)
Control	Boys	4.80 (0.42)	8.16 (1.68)	6.41 (1.58)	1720 (962)	1746 (1166)	1896 (1144)
	Girls	4.11 (1.02)	8.05 (1.31)	6.33 (1.35)	1536 (666)	2642 (1242)	1495 (593)

Note. *n* = 38 for all variables, with the exception of the few variables with missing data and aggressive response times, which were only available for participants who endorsed aggressive responses.

Table 3

Zero-ordered Correlations Between Demographic Variables and Dependent Variables

Variables	1.	2.	3.	4.	5.	6.
1. Sex	__					
2. Annual Household Income	.080	__				
3. Parent-Rated Aggression	-.199*	-.052	__			
4. Competent Responses	.224*	.286**	-.175+	__		
5. Flanker Composite Score	-.035	.059	.042	.193*	__	
6. Post-Training Emotion	-.117	.158+	.145	.272**	.071	__
7. Response Times (VSG)	-.009	-.050	-.096	-.097	-.006	-.280***

Notes. + $p < .10$, * $p < .05$, ** $p < .01$. The "annual household income" variable consists of six income categories of increasing amount used on the demographic survey.

Virtual School Game

Number of competent responses. A 3 (training condition) X 2 (sex) X 2 (income) between-subjects ANOVA was conducted on the number of competent responses endorsed during the VSG. There was a significant main effect for condition, F (2, 113) = 3.983, p = .022, η^2_p = .072. Post hoc LSD tests at the .05 level revealed that the participants in Taxing condition selected significantly fewer competent responses (M = 6.868, SE = 0.476) than those in the Control condition (M = 8.105, SE =0.241) and marginally fewer than those in the Mindfulness condition (M = 7.684, SE = 0.342) which

not differ from the Control condition. There was a significant main effect for income, $F(1, 113) = 17.94$, $p < .001$, $\eta^2_p = .150$; participants from lower income families chose fewer competent responses ($M = 6.250$, $SE = 0.475$) than those from higher income families ($M = 8.167$, $SE = 0.187$). There was also a trending main effect for sex, $F(1, 113) = 3.587$, $p = .061$, $\eta^2_p = .034$; girls chose marginally more competent responses ($M = 8.070$, $SE = 0.215$) than boys ($M = 7.035$, $SE = 0.361$).

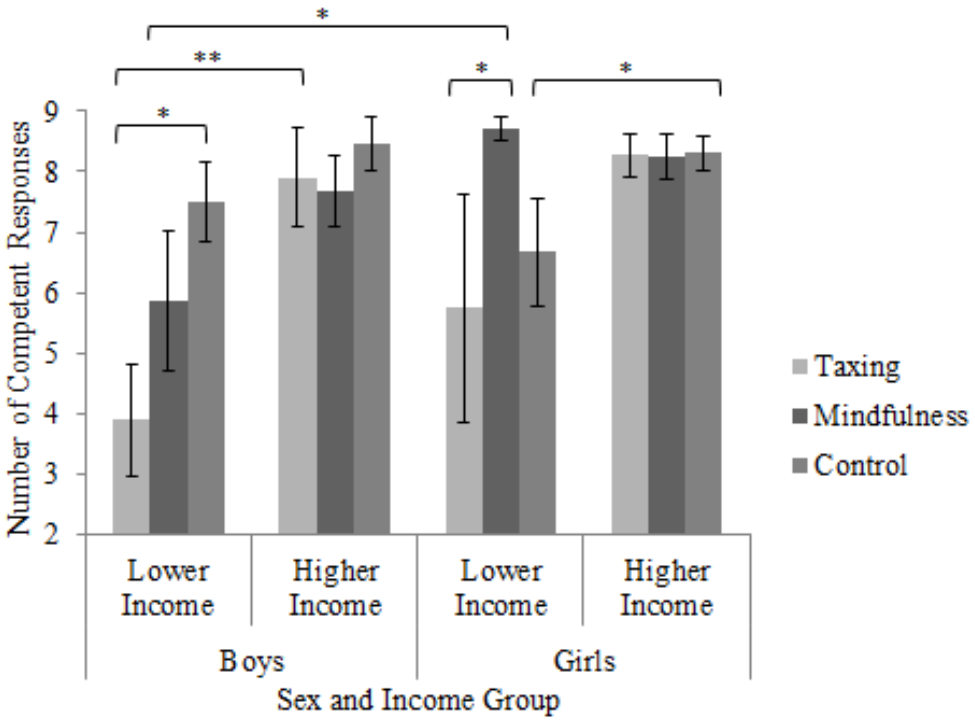
The main effects were qualified by two interactions: the interaction between condition and income, $F(2, 113) = 3.816$, $p = .025$, $\eta^2_p = .070$, and the marginally significant interaction between condition and sex, $F(2, 113) = 2.434$, $p = .093$, $\eta^2_p = .046$ (see Figure 4). The condition X income interaction indicated that condition assignment affected performance on the VSG only for lower income participants. A one-way ANOVA and post hoc LSD tests at the .05 level revealed that lower income participants in the Taxing condition ($M = 4.462$, $SE = 0.852$) choose significantly fewer competent responses than lower income participants in the Control ($M = 7.222$, $SE = 0.521$) and Mindfulness ($M = 7.286$, $SE = 0.691$) conditions, but the Mindfulness and Control conditions did not differ, $F(2, 35) = 4.891$, $p = .014$, $\eta^2_p = .229$. Higher income participants chose more competent responses than lower income participants in the Taxing condition ($M_{higher} = 8.120$, $SE_{higher} = 0.359$), $t(36) = 3.907$, $p = .001$, and in the Control condition ($M_{higher} = 8.379$, $SE_{higher} = 0.255$), $t(36) = 2.139$, $p = .039$ but not in the Mindfulness condition ($M_{higher} = 7.958$, $SE_{higher} = 0.343$), $t(36) = 0.872$, $p = .394$.

Although the three-way interaction between sex, income, and condition was not significant, $F(2, 113) = 1.094$, $p = .339$, Figure 4 illustrates that the condition X sex

interaction is driven by the performance of the lower income participants. Simple pair-wise comparisons at the .05 level confirmed that higher income boys and girls did not differ from each other by training condition. However, lower income girls chose significantly more competent responses (M = 8.714, SE = 0.184) than lower income boys (M = 5.857, SE = 1.164) in the Mindfulness condition, t (12) = 2.425, p = .050. The two groups did not differ in the Control or Taxing conditions.

Figure 4

Means and Standard Errors of Competent Responses on the VSG by Training Condition, Sex, and Income



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

Response times. A 3 (training condition) X 2 (sex) X 2 (income) between subjects ANOVA was performed to examine the effects of condition, sex, and income on overall VSG response times. No significant effects were found. However, that may be because both aggressive and competent responses were included together in the analysis. As hypothesized, aggressive responses may be faster in accordance with the RED model (Fontaine & Dodge, 2003). To assess this, I only considered response times for participants that chose both aggressive and competent responses, n = 44 (see Table 4 for demographic information about this subset). A 3 (condition) X 2 (sex) X 2 (income) X 2 (response type) mixed ANOVA with response type as a repeated measure revealed a two-way interaction between response type and sex, $F(1, 43) = 4.389$, $p = .044$, $\eta^2_p =$ .122 (Figure 5). Girls took a marginally longer time to choose aggressive responses than boys, $t(42) = 1.852$, $p = .075$. In addition, girls took a longer time to choose aggressive responses than competent responses, $t(19) = 2.175$, $p = .042$, while response times did not differ for boys, $t(23) = .898$, $p = .379$.

Differences in competent response times by condition were then assessed for each sex. An one-way ANOVA revealed that response times for competent choices marginally differed for girls by condition, $F(2, 56) = 2.986$, $p = .059$, $\eta^2_p = .100$. Post hoc LSD tests at the .05 level revealed that girls in the Mindfulness condition took significantly more time to choose a competent response than girls in the Control condition and marginally more time than girls in the Taxing condition, while the Taxing and Control conditions did not differ. A one-way ANOVA revealed that response times for competent choices did not differ for boys by condition, $F(2, 55) = 0.112$, $p = .894$ (see Figure 6).

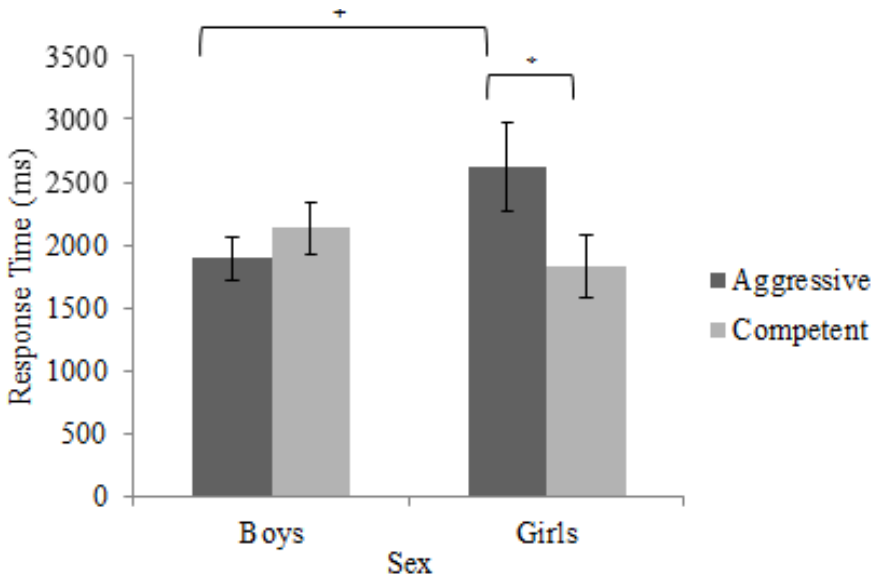
Table 4

Demographics (in number of participants) for the Subset of the Sample that Chose Both Aggressive and Competent Responses on the VSG

Variables			
Sex	Girls		Boys
	20		24
Income	Lower Income		Higher Income
	22		22
Condition	Mindfulness	Taxing	Control
	15	15	14

Figure 5

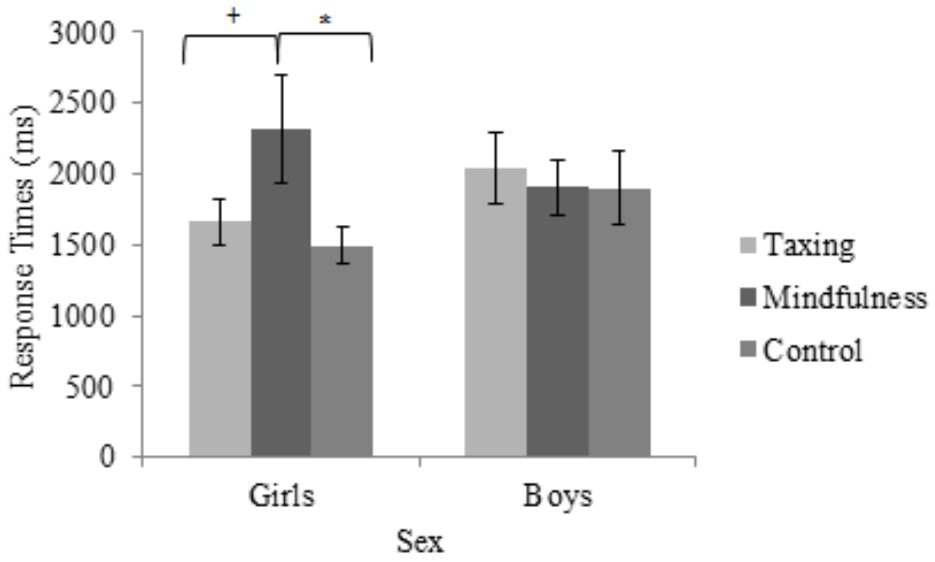
Means and Standard Errors of VSG Median Response Times by Response Type and Sex



+ $p < .10$, * $p < .05$

Figure 6

Means and Standard Errors of VSG Competent Median Response Times by Sex and Condition



+ $p < .10$, *$p < .05$

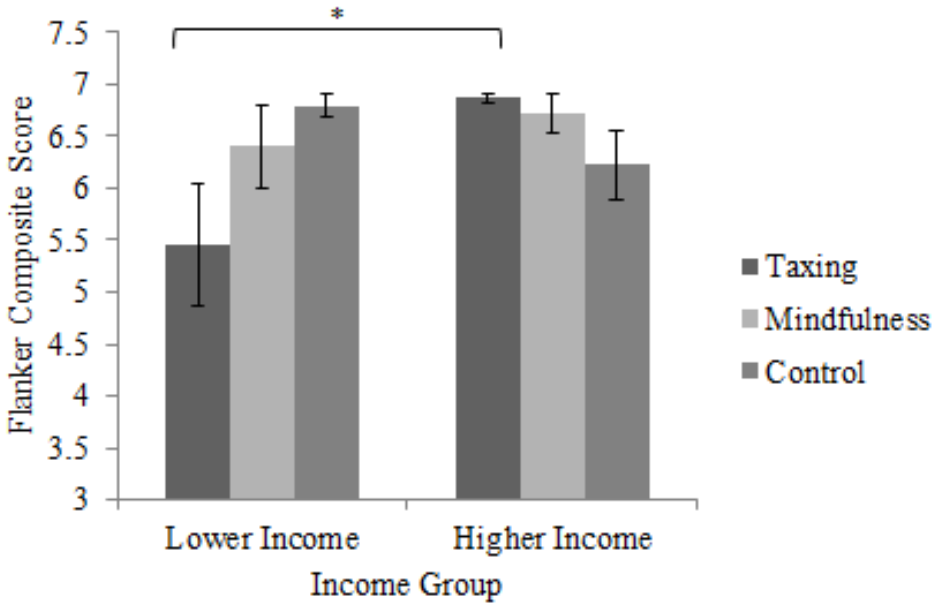
Flanker Task

A 3 (condition) X 2 (sex) X 2 (income) between subjects ANOVA was performed on the effects of training condition, sex, and income on flanker task composite scores (Figure 7). There was a significant interaction between income and condition, $F(2, 107) = 4.443$, $p = .014$, $\eta^2_p = .086$. Post hoc simple pairwise comparisons revealed that higher income participants had better flanker performance ($M = 6.866$, $SE = 0.048$) than lower income participants ($M = 5.451$, $SE = 0.595$) in the Taxing condition, $t(34) = 2.371$, $p = .037$, but the two groups did not differ in any other condition. One-way ANOVAs revealed that there were no significant differences between conditions within each

income group, F_{lower} (2, 33) = 2.175, p = .130, η^2_p = .120; F_{higher} (2, 71) = 2.218, p = .117, η^2_p = .060.

Figure 7

Means and Standard Errors of Flanker Performance by Condition and Income



*p < .05

Flanker task and competent responses. Overall, flanker task accuracy correlated with choosing competent responses on the VSG, r (107) = .193, p = .046 This association was significant in the Taxing condition, r(36) = .353, p = .035, marginally significant in the Mindfulness condition r(37) = .213, p = .206, but not significant in the Control condition r(35) = -.130, p = 463.

Emotion Ratings

A one-way ANOVA revealed that participants differed in pre-training emotion, $F(1, 112) = 6.886$, $p = .002$. Post hoc Tukey HSD tests confirmed that participants in the Taxing condition endorsed significantly lower emotion ratings ($M = 4.026$, $SE = 0.212$) than the Control condition ($M = 4.658$, $SE = 0.109$) and the Mindfulness condition ($M = 4.737$, $SE = 0.098$). The Mindfulness and Control conditions did not differ.

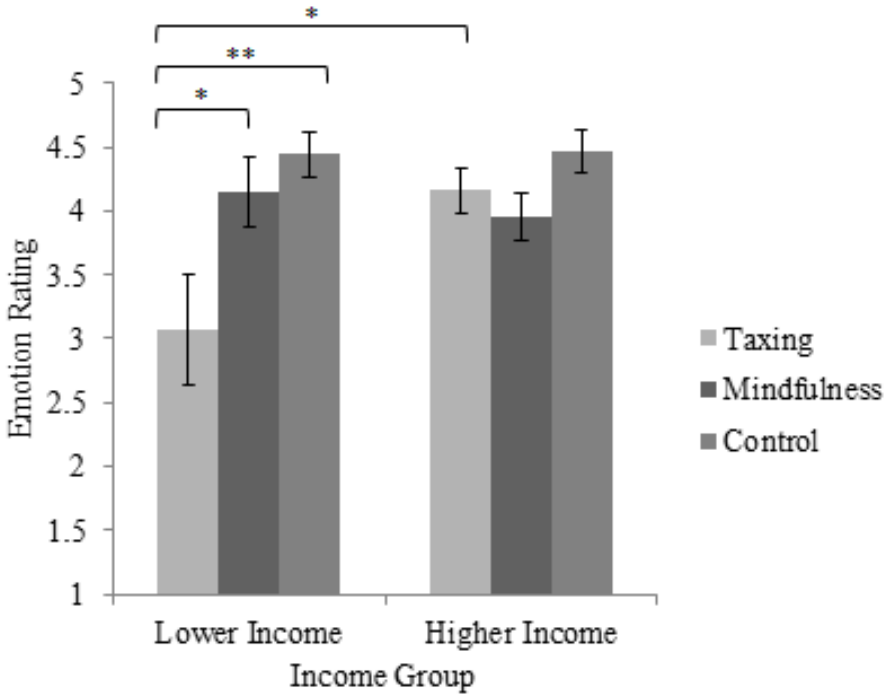
As post-emotion rating was of particular interest to the current study, a 3 (condition) X 2 (sex) X 2 (income) between subjects ANOVA was performed on the effects of condition, sex, and income on post-training emotion ratings. An ANCOVA controlling for pre-training emotion ratings was also conducted and did not produce any difference in results.

There was a significant main effect for condition, $F(2, 112) = 6.175$, $p = .002$, $\eta^2_p = .115$. Post hoc LSD tests at the .05 level revealed that the participants in the Control condition endorsed significantly higher post-training emotion ratings ($M = 4.460$, $SE = 0.138$) than the Taxing condition ($M = 3.790$, $SE = 0.204$) and marginally higher post-training emotion ratings than the Mindfulness condition ($M = 4.026$, $SE = 0.153$). The Taxing and Mindfulness conditions did not differ from each other. There was a significant main effect for income, $F(1, 112) = 3.945$, $p = .050$, $\eta^2_p = .038$; lower income participants endorsed a lower post-emotion rating ($M = 3.833$, $SE = 0.213$) than higher income participants ($M = 4.208$, $SE = 0.105$). There was also trending main effect for sex, $F(1, 112) = 3.510$, $p = .064$, $\eta^2_p = .034$, as girls endorsed lower post-training emotion ratings ($M = 3.964$, $SE = 0.142$) than boys ($M = 4.211$, $SE = 0.139$).

A significant two-way interaction between condition and income further qualified the condition and income main effects, $F(2 , 112) = 5.457$, $p = .009$, $\eta^2_p = .098$ (see Figure 8). Lower income participants endorsed significantly lower post-training emotion ratings (M = 3.077, SE = 0.431) than higher income participants in the Taxing condition ($M = 4.160$, $SE = 0.180$), $t(36) = -2.321$, $p = .034$, but did not differ from higher income participants in either the Mindfulness, $t(36) = 0.576$, $p = .568$, or Control conditions, $t(35) = 0.61$, $p = .952$. A one-way ANOVA with post hoc LSD tests at the .05 level revealed that lower income participants endorsed significantly lower post-training emotion s in the Taxing condition than in the Mindfulness condition ($M = 4.143$, $SE = 0.275$) and in the Control condition ($M = 4.444$, $SE = 0.176$), but the Mindfulness and Control conditions did not differ, $F(2, 35) = 4.465$, $p = .019$, $\eta^2_p = .213$. A separate one-way ANOVA on post-training emotion rating for higher income participants was not significant, $F(2, 76) = 2.048$, $p = .136$, $\eta^2_p = .052$.

Figure 8

Means and Standard Errors of Post-Training Emotion Ratings by Condition and Income



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

Post-training emotion ratings and competent responses. Overall, post-training emotion ratings correlated with choosing competent responses on the VSG, $r(113) = .272$, $p = .004$. However, this association was only significant in the Taxing condition, $r(38) = .337$, $p = .038$. Competent responding and emotion ratings did not significantly correlate in either the Mindfulness, $r(38) = .144$, $p = .390$ or the Control conditions, $r(37) = .058$, $p = .733$.

Parent Questionnaire Data

Overall, parent-rated aggression was marginally and negatively correlated with choosing competent responses on the VSG, $r(108) = -.175$, $p = .069$. This association was not significant in any of the individual training conditions. To see if parent-rated aggression contributed significant variance to choosing competent response on the VSG, I conducted a series of hierarchical linear regressions. Training condition, sex, and income were entered in the first step and significantly predicted choosing competent responses on the VSG, $R^2 = .170$, $p < .001$. Parent-rated aggression was entered in the second step, but this addition did not result in a significant R^2 change, $R^2 = .182$, $\Delta R^2 = .012$, $p = .210$. The lack of a significant R^2 change with the addition of parent-rated aggression suggested that the participants' normative levels of aggression did not significantly contribute to choosing competent responses on the VSG above and beyond the other variables considered in the model

CHAPTER IV

DISCUSSION

The primary goal of the current study was to investigate how mindfulness and taxing training affected responses to peer conflict, and to further understand the association between EF and social competence. I hypothesized that the participants in the Mindfulness training condition would choose the most competent responses to peer conflict compared to the Taxing and Control conditions whereas the participants in the Taxing condition would choose the least number of competent responses. I further hypothesized that this pattern of results would occur because of the different effects taxing and mindfulness trainings would have on cognitive and emotion processes. The hypotheses were partially supported; taxing training produced the lowest number of competent responses and lowest post-training emotion ratings. However, this only applied to lower income participants, and in particular boys. By comparison, the higher income participants did not differ on competent responses or emotion ratings by condition. Flanker performance did not differ between conditions for either income group, but lower income participants had significantly worse performance than the higher income participants in the Taxing condition. In addition, mindfulness training did not appear to produce an increase in competent responding, post-training emotion, or flanker performance for any group of participants when compared to the Control condition and i

some instances, performance in the Mindfulness condition was more similar to performance in the Taxing condition.

With these results in mind, the main questions to address are the following: 1) why did the Taxing condition produce the lowest number of competent responses and why did it only occur for lower income participants? 2) Why didn't mindfulness training produce the expected increase in competent responses? and 3) What do the results means in regard to reflection as a shared mechanism for EF and social competence in peer conflict?

To address the first question – why did lower income participants choose fewer competent responses in the Taxing condition – the post-training emotion ratings and the flanker task results must also be discussed. As mentioned, the Taxing condition produced the lowest post-training emotion ratings and a difference in flanker performance by income. It is important to note that for the current study, "lower" emotion ratings means "less positive" and not necessarily "negative", as the lower income taxing condition mean was 3.077 (5 was "very happy" and 1 was "very angry"). In addition, post-training emotion ratings and flanker task performance were associated with competent responses only in the Taxing condition. The participants who were more likely to have lower post-training emotion ratings and worse flanker performance in the Taxing condition were lower income individuals, as indicated by the income by condition interactions for both variables. These same individuals were also more likely to endorse fewer competent responses on the VSG.

These results provide support for Forgas and Eich's (2013) feelings-as-information theory and Orobio de Castro's (2004) dual processing model. The feelings-as-information theory posits that negative affect primes individuals to respond aggressively and that the source of negative emotions is often misattributed to the current situation and used to inform behavioral responses. The dual-processing model further elaborates on the feelings-as-information theory with the incorporation of EF in conjunction with emotional processes in responses to social situations. The dual-processing model postulates that individuals will follow an emotional response route triggered by negative emotions only if the expression of these emotions overwhelms an individual's EF. Individuals with higher levels of EF can better tolerate the negative emotions associated with peer conflict and are more likely to follow the reflective route in response to peer conflict. The dual-processing model postulates that individuals that follow the emotional response route enact a dominant, aggressive response to the conflict while those that follow the reflective route are more likely to enact a competent response.

Thus, lower income participants may have selected fewer competent responses in the Taxing condition because they either experienced less positivity before or during the VSG, worse EF in the Taxing condition, or a combination of both. By comparison, the higher income participants had better performance on the flanker task and their emotion ratings were significantly higher than those of lower income participants in the Taxing condition so it would be expected that they would also have a higher number of competent responses in the Taxing condition as well. It is important to note the pattern of worse performance across all measures for lower income participants only occurred in the

Taxing condition. The lower income participants did not differ from higher income participants on post-training emotion ratings or in flanker performance in either the Control or Mindfulness conditions, and they did not differ in the number of competent responses chosen in the Mindfulness condition. Therefore, it would be misleading simply to conclude that lower income children are generally more aggressive than higher income children because lower income children have generally lower EF or are typically less happy than higher income children. Instead, it appears that the lower income participants were more sensitive to the training conditions.

One of two things could have happened for the lower income participants. They could have been more sensitive to the Taxing condition specifically, so that performance in the Mindfulness and the Control conditions was indicative of normative performance, or they could have benefited from both the Mindfulness and Control conditions, and performance in the Taxing condition was more indicative of normative performance. Indeed, performance in the Taxing condition was more indicative of previously reported differences between higher and lower income children. Poverty has been linked to aggression in early childhood (Brooks-Gunn & Duncan, 1997; Letourneau, Duffett-Leger, Levac, Watson, & Young-Morris, 2013) and delays in EF development (Clearfield & Niman, 2012; Marcovitch, Clearfield, Swingler, Calkins, & Bell, 2016).

To this end, poverty is likely a proxy for other constructs that contribute to the development of EF and social behavior. The coercion model of parenting is one potential pattern of behavior associated with poverty that could lead to higher levels of aggression and lower EF in low income children (Beeber et al., 2014; Martorell & Bugental, 2006).

Coercive parenting is a pattern of repetitive parental reinforcement of children's negative behaviors to provide short-term relief from the negative behaviors (Eddy, Leve, & Fagot, 2001; Patterson, 1982). This pattern of parenting is associated with later aggressive behavior (Beauchaine & McNulty, 2013; Shaw, Gilliom, Ingoldsby, & Nagin, 2003) and problems with self-regulation (Scarmella & Leve, 2004). Lower income mothers may be more likely to engage in coercive parenting because of higher rates of depression (Kessler et al., 2003; Shim, Baltrus, Ye, & Rust, 2011), higher levels of stress (Evans & English, 2002; McLoyd, 1998; Wadsworth & Berger, 2006), or a lower amount of perceived parenting self-efficacy (Coleman & Karraker, 2000), all of which are associated with poverty.

Within the coercion model, parents give in to child demands to stop displays of tantrum-like behaviors, expressions of negative affect, and aggression. Thus, children are provided with reinforcement for these problem behaviors and learn that these behaviors are an effective way to get what they want (Beuchaine & McNulty, 2013; Eddy et al., 2001; Patterson, 1982). In addition, children are not taught how to control their emotions and behaviors appropriately and independently in response to frustration or provocation (Scarmella & Leve, 2004). As these children enter school and face instances of peer provocation, they lack the necessary skills to navigate these scenarios in an appropriate manner and may react in an aggressive manner because that is the only way they have learned to deal with conflict and frustration.

Aside from the higher likelihood of experiencing the coercion model, poverty also has an impact on the amount of enrichment children are given in their daily lives and this

lack of enrichment could negatively affect EF development (Sheridan & McLaughlin, 2014). Children in poverty live in globally less enriching environments than higher income children, which includes many different aspects of their lives, ranging from language use in the home (Hart & Risley, 1995), to a lack of stimulating toys, reading materials, and situations in which they are required to use higher cognitive functions (Bradley, Corwyn, McAdoo, & Coll, 2001). Lack of enrichment has a negative impact on brain development and evidence suggests that growing up in poverty is correlated with changes in neurological structure, with less density in areas responsible for higher cognitive abilities, such as EF and reasoning (Hanson et al., 2013; Noble, Houston, Kan, & Sowell, 2012; Raizada & Kishiyama, 2010). Thus, the lower income participants in the current study may have had a harder time cognitively controlling their behavior on the VSG because their early environments led to disadvantaged development of EF.

These differences in EF and aggression between lower and higher income children were observed in the Taxing condition, but either lessened or disappeared in other conditions. It is possible that the Control condition had an unintended, positive effect on the participants. The Control condition produced the highest post-training emotion ratings for both higher and lower income participants, possibly because participants were able to play with toys during the training period. This is quite different than the mindfulness and taxing trainings that both require participants to follow directions, and often sit or lie still, for an extended period of time. Mindfulness training also appeared to have a positive effect on competent responses for lower income girls, as indicated by the interaction between sex and condition, but the lower income sample

sizes are too small to make any strong claims about the effectiveness of mindfulness in this subsample.

The Taxing condition could have also exacerbated these differences. Perhaps this was because the lower income participants had less EF resources to start with, as previously discussed, and thus were the only participants to experience resource depletion in the Taxing condition. Lower income participants could have also perceived the Taxing condition as more stressful or demanding. The lower post-training emotion ratings endorsed by lower income participants compared to higher income participants in the Taxing condition provides some support for this claim. It is possible that abnormal stress reactivity was a factor that affected lower income participants' reactions to the taxing training. Abnormal stress reactivity, typically identified through measures of cortisol (Blair, Raver, Granger, Mills-Koonce, & Hibel, 2011) and cardiac vagal tone (Calkins & Keane, 2009), is more characteristic of lower income individuals because of an increase in daily life stressors that higher income individuals are less likely to experience (Blair et al., 2011). Patterns of maladaptive stress reactivity have also been linked to deficits in emotion regulation (Calkins & Keane, 2009), EF (Blair, Granger, & Raver, 2005), and social competence (Murray-Close et al., 2014). The lower income participants that had maladaptive stress reactivity could have been more sensitive to the demands of the Taxing condition, which instigated a negative emotional reaction to the training procedure that carried over to performance on the subsequent tasks. Conversely, the Mindfulness condition and perhaps the Control condition as well, may have modulated

the experience of stress for lower income participants during the trainings and when they later experienced peer conflict situations on the VSG.

Despite the theoretical benefit of mindfulness training, particularly for the lower income sample, the Mindfulness condition did not produce the expected effect on competent responses on the VSG. Participants in the Mindfulness condition did not choose significantly more competent responses on the VSG compared to the Control condition overall, or more than the Taxing condition for boys and higher income participants. As previously discussed, the Control condition could have caused an unexpected, positive effect on VSG responses that concealed any benefit of mindfulness training but there are a number of other explanations for this pattern of results. It is also possible that mindfulness training failed to produce the expected increase in competent responses because it failed to provide a boost in EF and affect, which are thought to support competent responses to peer conflict (Denham et al., 2014; Lemerise & Arsenio, 2000; McQuade et al., 2013; Nigg et al., 1998).

It was surprising that mindfulness training did not improve performance on EF measures given existing research (e.g., Black & Fernando, 2013; Boguszewski & Lillard, 2015; Flook et al., 2010) and theory (e.g., Zelazo & Lyons, 2011, 2012). Maybe the mindfulness training used in the current study was too short to produce any change in EF, despite having done so in a previous study (i.e., Boguszewski & Lillard, 2015). Perhaps this increase in performance was not found in the current study because the majority of children in the current sample already had high EF and therefore would not benefit any further from mindfulness training. Examination of the median response times and mean

accuracy scores that comprise the flanker composite score revealed a general pattern of high performance and lack of variability in this measure for all but the lower SES participants in the Taxing condition. This could support the claim that most of the sample did not have much opportunity for improved performance, but it could also be an indication that the flanker task was not the most sensitive EF measure for this paradigm.

Diamond and Lee (2011) suggested that improvements in EF are only seen on tasks with high cognitive demand and it can be inferred that this would be the same for decreases in EF due to taxing situations. In general, tasks that only assess inhibition, such as the flanker task, are considered easier than tasks that assess both inhibition and working memory (Carlson, 2005). Past mindfulness research using the flanker task has shown mixed results. In a sample of 9- to 11-year-olds, Schonert-Reichel et al. (2015) found that only response time, but not accuracy differed between a mindfulness training group and a control group. In a sample of 4-to 5-year-old children, Flook et al. (2015) found that improvements observed on the flanker task in their mindfulness group did not significantly differ from the improvements in the control group but the small between-groups effect size favored the control group. In comparison, performance on the Dimensional Change Card Sort, an EF measure of cognitive flexibility that requires both inhibition and working memory (Garon et al., 2008), did not significantly differ between control and mindfulness groups but the medium between-groups effect size favored the mindfulness group. Thus, although Flook et al. did not find significant improvements on either EF task in their mindfulness group compared to the control group, examination of

the between-group effect sizes supports the claim that the flanker task is not as sensitive as more difficult EF tasks in capturing the effects of mindfulness on EF.

The participants in the Mindfulness condition also had marginally lower post-training emotion ratings than those in the Control condition and their ratings did not significantly differ from those in the Taxing condition. Furthermore, the participants in the Mindfulness condition had higher pre-training emotions than those in the Taxing condition, which indicates that the Mindfulness condition caused a decrease in positive affect. Thus, the emotion rating results contradicted the hypothesis that mindfulness training would boost positive emotions. Perhaps these results could also be an indication of why mindfulness training did not produce the highest number of competent responses on the VSG. Participants were happiest in the Control condition and this could have led to the high number of competent responses that masked the effect of mindfulness. In addition, the participants who felt a decrease in happiness in the Mindfulness condition could have been swayed to choose fewer competent responses. However, the lack of a significant correlation between emotion ratings and competent responses in either the Control or the Mindfulness conditions challenges this interpretation.

Therefore, it is more likely that the Mindfulness condition performance on the VSG is due to something other than EF and affect. It is possible that typically developing children are overwhelmingly oriented towards competent solutions to peer conflict and therefore have no need for the improvement hypothesized by mindfulness training. In the current study, the mean number of competent responses was close to ceiling in all conditions, particularly for the higher income participants. Across all conditions, 61% of

the total sample chose all competent responses and no aggressive responses on the VSG, which indicates that the majority of the sample was in favor of competent solutions to peer conflict. Past research has also found that competent responses to peer conflict are often endorsed a greater number of times than aggressive responses (Denham et al., 2013, 2014). For example, in Caporaso et al. (2016), 45% of the participants endorsed solely competent responses, with another 19% of participants who selected competent responses all but one time. In general, incidents of aggression in typically developing samples occur less frequently compared to competent behavior (Broidy et al., 2003; Persson, 2005; Westlund et al., 2008) and compared to samples of special populations, such as children with ADHD (Becker et al., 2012; Murray-Close et al., 2010).

For children who are strongly oriented towards competent responses, it is possible that any effect on these children's EF or affect is inconsequential. This could provide an explanation for the seemingly contradictory finding that girls had marginally lower post-training emotion ratings yet selected marginally more competent responses on the VSG. The RED model (Fontaine & Dodge, 2006) and the dual-processing model (Orobio de Castro, 2004) both make the assumption that children have a habitual or dominant aggressive response to conflict. This response must be suppressed in favor of a competent response so anything that interferes with a child's ability to exert this sort of control could cause the enactment of the dominant aggressive response. Both the RED model and the dual-processing model posit that the dominant aggressive response is a quick response to conflict, while the competent response that requires more control takes a longer time. But perhaps some children do not have a dominant aggressive response and

they can quickly enact competent responses with minimal control. In this regard, it would not matter if these children feel strong negative emotions that could affect their EF abilities; they will still respond to the conflict in a competent manner because they do not have an aggressive response to inhibit.

There is some evidence from the current study to support this claim. Response times on the VSG indicated that girls took significantly longer to choose competent responses in the Mindfulness condition compared to the Taxing and Control condition, yet overall, girls did not differ on the number of competent responses chosen between the three conditions. So whether girls responded quickly or took time to consider their response options, they still chose competent responses. Furthermore, the slower response times in the Mindfulness condition compared to the other two conditions indicates that mindfulness did have some effect on reflective processes for girls, but this effect was inconsequential in relation to competent responses to social situations. In addition, girls that did choose an aggressive response took a significantly longer time to do so compared to competent responses. Perhaps, for girls, competent responses are dominant responses while aggressive responses require more reflective thought for girls. Hence, a decrease in positive emotion would not affect the likelihood that girls choose a competent response to peer situations. Girls also took a marginally longer time to choose aggressive responses than boys, which could mean that aggressive responses require less reflective thought and may be more impulsive for boys. However, response times for boys did not differ by response type or by condition so it is hard to make any claims about dominant versus

reflective responses for them as a group and there may be more individual differences between boys.

The discussion of response times leads to the third and final question to be addressed: what do the results of the current study mean for reflection as an underlying mechanism for competence in social situations? There are mixed results in support of reflection as a shared underlying mechanism between social competence in peer conflict and executive function. Taxing training had an effect on EF, affect, and competent responses on the VSG, which suggests that the likelihood to engage in reflection was successfully manipulated. However, this was only for lower income participants. Furthermore, response time results for the VSG indicated that girls in the Mindfulness condition were more likely to engage in reflection than girls in the Taxing and Control condition, but the increase in reflection did not correspond to an increase in competent responses. In fact, girls were more likely to reflect when endorsing aggressive responses compared to competent responses.

These results lead to the conclusion that reflection may only matter in social situations for children who have a dominant aggressive response that requires EF to inhibit. Perhaps the documented associations between EF and social competence that exist in the literature are due to other factors that contribute to the development of EF and social competence. Longitudinal research on the trajectories of aggressive behavior suggest there is a normative pattern of aggressive behavior in late infancy that decreases through school age for the majority of children, but there is a smaller group of children who are consistently high in their use of aggression (Carbonneau et al., 2016; Hill,

Degan, Calkins, & Keane, 2006; Tremblay et al., 2005). Tremblay et al. (2005) found that parenting behaviors, such as smoking during pregnancy, coercion, and overall family dysfunction, were predictors of high and consistent aggression. Perhaps these same factors contribute to the development of EF; they further suggest that children on this trajectory do not learn the self-regulation skills required to inhibit displays of aggression, unlike the children on the decreasing aggression trajectory. As children on the decreasing aggression trajectory develop self-regulation skills, including EF, the aggressive tendencies that were dominant in early childhood become replaced by internalized social and moral norms so that these norms become the habitual social response (Tremblay, 2004).

Thus, EF is important in the development of social competence, but only to the extent that children can internalize competent behaviors. Once these behaviors become habitual, EF may no longer be needed in day-to-day social activity. There is some experimental evidence to support this theory. Kochanska and Knaack (2003) found that EF at an earlier age predicted 4-year-old's levels of conscience, or internalized conduct. Caporaso et al. (2016) found that improvements in EF accounted for developmental differences in competent responses to peer conflict and negative evaluations of aggression between 4 and 5-years-old. Thus, EF may assist with this process of internalization of moral rules and the cross-sectional sample in Caporaso et al. may have captured the timeline for this process. Because the current sample only consisted of 5-year-old children, many of these children may have already internalized competent behavior and therefore did not need to engage in reflection to enact a competent response.

The lower income group of participants may consist of children who have not fully internalized competent behaviors so this group may have required more assistance from EF and reflective processes to choose competent responses.

Limitations

The current study has a few key limitations that should be addressed in future research. The mindfulness training procedure used in the current study was atypically short compared to the procedures used in other mindfulness training studies (e.g., Black & Fernando, 2013; Flook et al., 2010, 2015; Napoli et al., 2005 ; Schonert-Reichl et al., 2015). The brevity of the training could have contributed to the lack of effect on competence in social situations. Although Boguszewski and Lillard (2015) found that EF received a boost after a brief session of mindfulness training, perhaps changes in social behavior require longer, more extensive periods of mindfulness training. Research with typically developing samples that used longer procedures found positive effects on social competence (Flook et al., 2015; Napoli et al., 2005) and other types of prosocial behavior, such as sharing (Flook et al., 2015). These same studies also used pre/post within-subjects designs to capture the change associated with mindfulness training. With the exception of emotion ratings, pre/post measures were not used in the current study because there were concerns about practice effects given the brevity of the training periods. However, the use of a pre/post design in the current study would have helped answer the question regarding whether the lower income participants benefited from the Control and Mindfulness trainings or if they were more sensitive to the Taxing training. It would have also helped establish whether the Control condition had a positive effect on

the dependent measures, as these possible unintended effects were an additional limitation.

Another key limitation in regard to the mindfulness training procedure was the lack of contextual information provided to the participants in the Mindfulness condition. Children could have perceived mindfulness training as something different, and even strange when compared to what they normally do in a school or home setting. Both the taxing and control procedures are more representative of what children do in their daily lives. In regards to the taxing procedure, children are often asked to sit quietly and follow directions and although this may be difficult for some children, it is still something with which they are familiar. However, many children do not engage in mindfulness practices in their daily lives. The unfamiliarity of the training procedures could have negatively affected participants' experience of the Mindfulness condition. In studies that had longer mindfulness training procedures, part of the training likely included an explanation about why the children were being asked to complete the unfamiliar activities. Perhaps some of the expected improvements would have been seen if the participants were told why they were completing the mindfulness tasks and why mindfulness is important.

Another methodological limitation is the differences in task order between the mindfulness and taxing trainings. The participants in the Mindfulness condition completed the gummy bear task first, while the participants in the Taxing condition completed the gummy bear task last. Perhaps participants in the Taxing condition would have performed more similarly to the Mindfulness condition if the order was consistent. This could lead to the conclusion that it is not necessarily the existence of guided

directions that lead to differences in performance between the two conditions, but the order in which the gummy bear task is presented. It is the longest, and potentially most difficult, task out of the four and its individual contribution to the trainings does require further examination.

The use of the flanker task was also a potential limitation of the current study. As discussed, the flanker task may not have been sensitive enough to capture the effects of mindfulness training because it was not a very challenging task for the current sample. This could be partially due to the use of feedback after every test trial. Past research with the flanker task in this age group have used both feedback (e.g., McDermott et al., 2007; Rueda et al., 2004) and no feedback (e.g., Zelazo et al., 2013). The two types of flanker tasks have not been directly compared, but it is certainly possible that the use of feedback made the task easier because it provided participants with indirect rule reminders when they chose an incorrect answer on a trial. Future research should further delineate which EF tasks are the most appropriate for mindfulness training paradigms.

Finally, the current study was limited in its use of income as a sole indicator of socioeconomic status (SES). Annual household income is just one indicator of SES and it is not entirely conclusive of SES status on its own. Studies that examine the effects of SES often use indices of many SES variables to determine SES status (Letourneau et al., 2013). Other SES indicators include maternal education and income to need ratios. SES was not an a priori consideration and because of this, other indicators of SES were not collected beyond the standard demographics sheet nor were participants matched by income to the training conditions. In addition, different income groups were not evenly

sampled from the community so there was an over-representation of higher income participants in the current study. Conclusions regarding SES are limited because of these factors. Future studies should take these considerations into account to examine further the effects of SES on EF, social competence, and the potential benefits and costs that this group may receive from mindfulness training and taxing situations.

Future Directions

Beyond addressing the limitations of the current study, future research should focus on when EF is needed in social situations. In the current study, children were asked to pick between social responses that were clearly aggressive versus ones that were clearly competent. Perhaps more reflection is required when the response choices are more ambiguous, or if participants are told that an aggressive response is an acceptable response in certain circumstances. Indeed, Richardson et al. (2012) proposed that reflection would be necessary in circumstances that go against typical moral standards, such as being told it is acceptable to hit someone that enjoys being hit (Zelazo et al., 1996). Although it is unlikely that children will be faced with these types of experiences in their everyday lives, it will provide a clearer picture of the how EF supports social decision making.

It is also important to continue research on the types of situations that could exhaust children's cognitive and emotional resources. The Taxing condition had an apparent effect on lower income children and it is likely that similar situations occur outside of the laboratory. Further understanding on when children may be more vulnerable to peer conflict and more likely to react aggressively may help inform

intervention and promote practices that counteract these effects prior to engaging in peer play. Even if children do not have a habitual aggressive response, taxing situations may affect how children respond to more ambiguous social interactions, or interactions that go against typical moral standards, as these events may require additional cognitive resources to construct an appropriate response. Additionally, future research could determine if taxing situations interfere with other aspects of social cognition that are related to EF in typically developing samples, such as theory of mind (e.g., Miller & Marcovitch, 2012).

Finally, future research should focus on the concurrent development of EF and social competence. Studies designed to examine EF, moral understanding, and social competence across early and middle childhood could provide additional evidence that EF is an important factor in the internalization of moral norms and in the development of social competence. In addition, research on the factors that contribute to the development of both EF and social competence can provide more information about why the association between the two constructs exists even if some children do not have to rely on EF consistently to make competent choices in social situations. Early developmental factors, such as parenting, temperament, and SES are a few factors that warrant further study. Better understanding of these factors may provide direct implications for intervention by identifying which children will receive the most benefits from mindfulness training, as well as experience detrimental effects from cognitively and emotionally taxing situations.

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APPENDIX A

MINDFULNESS TRAINING PROCEDURE

Gummy Task, 5 min total

Part I: 3 min

1. Tell Child:
    a. *"We're going to have a snack, but it's a slow snack. We're going to take our time."*
2. Put one gummy bear on a plate in front of the child. Say this slowly, not all at once. Fine if they answer or not. Start timing:
    a. **At 0 seconds:** *"Look at this gummy. Let's look at it very carefully, like you will have to describe it to someone who has never seen one before, like an alien!"*
    b. Pause
    c. **At 15 seconds:** "*Notice the color. Note the texture. Explore the gummy with your eyes.*
3. Let them answer these questions and share their observations:
    a. **At 30 seconds:** *"Let's think about what color the gummy is. Are there changes in color at different parts of the gummy?"*
    b. **At 45 seconds:** *"What is the surface like—does it have wrinkles or is it smooth?"*
        i. **At 1:15 seconds:** *"How else you would describe the texture."*
4. **At 1:30 minutes:** Instruct child to pick up the gummy bear and continue to ask them questions about it:
    a. *"Now pick up the gummy. Explore the gummy with your fingers. Is it soft or hard?"*
5. Pause and let them answer between each question/line
    b. **At 1:45:** *"Does it feel the same throughout the whole gummy?"*
    c. **At 2:05:** "*How does it smell?"*
    d. **At 2:25:**"*Think about how much it weighs and how heavy it is.*
    e. **At 2:45** *"Think about how this gummy is a bear and what it would look like and be like as a real bear.*

[Total time elapsed: 3 min]

Part II: 1 min

1. Put the gummy bear on a coffee stirrer and ask kids to put in their mouths, but be clear not to chew it yet! Ask these questions pausing between each one, even if they are not giving answers.
    a. **At 0 seconds:** *"Put the gummy in your mouth like this [mime sticking lollipop in mouth], but* do not *chew it yet."*
    b. **After short pause:** *"Close your eyes. Think about how the gummy feels in your mouth."*

c. **At 15 seconds:** *"Notice the flavor of the gummy. Notice how the gummy feels."*
    i. Sometimes children will answer these questions, sometimes they will not, either way is fine, do not need to force them to answer
d. **At 25 seconds:** *"Move it to different parts of your mouth."*
e. **At 35 seconds:** *"Does the gummy taste different in different parts of your mouth?"*
f. **At 45 seconds:** *"Does it feel different in different parts of your mouth?"*

[Total time elapsed: 4 min]

Part III: 1 min

1. Ask children to chew the raisin but make it clear they should not swallow it right away.
    a. **At 0 seconds:** *"Now bite the gummy off and chew it slowly like this [mime chewing slowly] but do not swallow it until I say so."*
    b. **At 10 seconds:** *"Notice how it feels."*
    c. **At 20 seconds:** "*Notice the tastes."*
2. Next ask these questions, pause between each one and let them answer.
    a. **At 30 seconds:** *"Does it taste different than before?"*
    b. **At 45 seconds:** *"Does the gummy feel different now?"*
3. After the last minute is up (totaling at 5 minutes) ask them to go ahead and swallow the gummy bear.

Line Walking: 2 min total [~ 5 minutes into training session]

1. Direct the child's attention to the tape outline of a circle on the floor.
    a. *"See this line on the floor that makes a circle? I want you to walk on the line, slowly putting one foot in front of the other. You have to make the toe of one foot touch the heel of your other foot!"*
    b. Walk along part of the circle demonstrating how to do this.
    c. *"Pay attention to your steps and make sure your foot is always on that line! Like this:"*
2. Now have them join and start timing:
    a. **BEFORE timing:** *"Now you try. Keep walking until I say otherwise"*
    b. **START TIMER:** *"Think about how it feels when you put weight on your foot during each step"*
3. Child should start walking on the line at this point. If you notice them speeding up, prompt with:
    a. **(repeat as needed)** *"Remember, to stay on the line and touch your heel to your toe with each step!*
4. Do this until they have walked for 2 minutes.

Tummy Breath: 2 min total [~ 7 minutes into training session]

1. Unfold Yoga Mat and lay it on the floor. Ask Child to lie down on the mat and get stuffed animal:

    a. *"Can you lie down on the mat right here? Great! This is my friend Tabby. He/she likes to sit on people's tummies. Can you put tabby on your tummy? Great! I want you to lay here until I say otherwise"*
2. Hand them the stuffed animal and have them place it on their tummy. <u>Start timing:</u>
    a. **At 0 seconds:** *"Notice how Tabby goes up and down with your belly when you breathe in and out. Watch Tabby go up when you breathe in, and down when you breathe out.*
    b. **At 30 seconds:** *"Keep breathing in and out slowly and notice how Tabby moves with each breath."*
3. If child stops, or keeps talking to you, etc., prompt with:
    a. (**repeat as needed)***"Watch to Tabby move! Notice how he/she goes up and down when you breath in and out"*
    b. Continue for 2 minutes

<u>Mindful Listening: 2 minutes [~ 9 minutes into training session]</u>

1. Get phone or computer ready to play the Meditation Bell Sound.
    a. *"I am going to play a sound for you. It is going to be loud at first, and then quiet. We're going to listen to the sound until we can't hear it anymore."*
    b. *"Close your eyes. When you can't hear the sound anymore raise your hand. We're going to do this a few times. Keep your eyes closed I'll tell you when to open your eyes."*
2. Play Meditation Bell track. After each time the track ends, tell the child:
    a. *"Okay, you can put your hand down. We're going to do this again."*
3. Play Track a total of 2 minutes.
4. Prompt to go back to listening—If the child talks, or asks questions, etc
    a. *"Let's listen to the bell. Remember to raise your hand when you can't hear it anymore"*

APPENDIX B

TAXING TRAINING PROCEDURE

Walking: 2 minutes total

1. Direct the child's attention to the outline of the circle on the floor and tell them to walk around it:
    a. *"See the line of the floor that makes a circle? I want you to walk around that circle for some exercise until I tell you to stop. I want you to walk very slowly around the circle so you don't get dizzy."* (Start timer)
    b. **45 seconds into walking, say**: *"Remember, we are walking around so you can get some exercise so let's keep walking!"*
    c. **1:15 minutes into walking, say**: *"Ok, remember that we want to exercise a little so you are going to keep walking"*
2. If children continue to ask what you are doing, tell them that you are *"just walking a little so you can get some exercise".*

Provide no further details or instruction. If child talks to you or asks you a task-unrelated question, you are allowed to answer them.

Tummy Breath: 2 minutes total [~ 2 minutes into training]

1. Unfold Yoga Mat and lay it on the floor. Ask child to lie down on the mat and get stuffed animal:
    a. *"Can you lie down on the mat right here? Great! This is my friend Tabby. He/she likes to lay down and rest for a little. Can you hold Tabby while you take a short rest? Great!"*
2. **1 minute into task, say**: *"Remember, we are just lying down to rest for a little after our walk. Tabby also likes to lay down and rest. We are going to rest until I tell you that our rest time is over."*
3. If child tries to get up, etc., prompt with:
    a. "*Remember, this is rest time after we took such a long walk! Can you keep resting for me? I will tell you when rest time is over."*

Provide no further details or instruction. If child talks to you or asks you a task-unrelated question, you are allowed to answer them.

Mindful Listening: 2 minutes total [~ 4 minutes into training]

1. Get phone or computer ready to play the Meditation Bell Sound and put toy options on the table.

a. "*I am going to play a sound for you. It is going to be loud at first, and then quiet. I'm going to play the sound for the next few minutes. Ok?"*

b. "*We are going to listen to the sound a few times. Please sit here quietly while we listen to the sound. I will tell you when we are done with the sound."*

2. Start the timer and play the meditation bell sound 3 times.
3. If child asks what the sound is:
    a. *"It's a bell and we are going to listen to it for the next few minutes"*

Provide no further details or instruction. If child talks to you or asks you a task-unrelated question, you are allowed to answer them.

<u>Gummy Task: 5 minutes total [~ 6 minutes into training]</u>

1. Tell the child:
    a. "We're going to have a snack, but it's a slow snack. We're going to take our time".
2. Place a gummy snack on a napkin in front of the child and start timing for 1.5 minutes.
    a. Tell the child: *"I want you to look at the gummy but you cannot touch it or eat it. We are going to look at the snack until I tell you to do something else".*
    b. **At 30 seconds**: "*Remember, we are having a slow snack and we are just going to look at the gummy until I say otherwise."*
    c. **At 50 seconds**: "*Alright, keep looking at the gummy until I tell you to stop because we are going to take our time eating this snack."*
    d. **At 1:10 minutes:** "*We are still looking at the gummy until I say otherwise. Remember to keep looking at the snack"*
3. After 1.5 minutes, instruct the child to pick up the gummy.
    a. Tell the child: *"Now I want you to pick up the gummy. I want you to just hold the snack in your hand so do not put it in your mouth until I tell you to".*
    b. Start timing once they pick up the snack for 1.5 minutes
    c. **At 30 seconds:** "*Remember, we are having a slow snack and I just want you to hold it in your hand until I say otherwise"*
    d. **At 50 seconds:** *"Alright, keep holding the snack until I tell you to stop because we are going to take our time eating this snack"*
    e. **At 1:10 minutes**: *"I want you to keep holding the gummy until I say otherwise. Just keep holding it in your hand"*
4. After 1.5 minutes of holding the gummy, stick a coffee stirrer into the gummy and ask the child to put the gummy into their mouth like a lollipop but not chew the gummy yet.
    a. Tell the child: *"Ok, now I want you to put the gummy in your mouth like a lollipop* (mime the gesture for them) *but do not chew it until I tell you otherwise.*
    b. Start the timer once the snack is in their mouth for 1 minute
    c. **At 10 seconds**: "*Remember to just hold it in your mouth but do not chew it yet"*
    d. **At 20 seconds**: *"Just keep holding it in your mouth but do not chew it"*

   e. **At 30 seconds**: *"Remember, it's a slow snack so don't chew the gummy yet, just hold it in your mouth"*
   f. **At 40 seconds**: *"Keep holding it in your mouth without chewing until I tell you otherwise"*
   g. **At 50 seconds**: *"Ok, we're still holding it in our mouth and not chewing it until I say stop"*
5. After 1 minute of holding the snack in their mouth, tell the child to bite the gummy off the stick and start chewing it.
   a. Tell the child: "*Ok, now you can bite the gummy off the stick and start chewing it but do not swallow the gummy yet. Just chew it slowly like this (mime slow chewing). Remember, it's a slow snack"*
   b. Start the timer as soon as the gummy goes into the child's mouth for 1 minute.
   c. **At 10 seconds**: "*Keep chewing it slowly, don't swallow it yet"*
   d. **At 25 seconds**: *"Remember, don't swallow it yet, keep chewing it slowly"*
   e. **At 35 seconds**: *"Ok, keep chewing the gummy, remember, it is a slow snack"*
   f. **At 45 seconds**: *"Keep chewing the gummy slowly but do not swallow it until I say so"*
   g. **At 1 minute**: *"Ok now you can swallow the gummy"*
   h. During this time, monitor the child's chewing and note if they swallow the snack earlier than a minute. Write down the time they swallowed the gummy if it is before 1 minute.
6. After the task, do not give them any positive feedback. Just say "Ok! Now we are going to move on to our next game!" and proceed with emotion question

APPENDIX C

CONTROL CONDITION PROCEDURE

Walking: 2 minutes total

1. Tell the child that you are going to go on a little walk so you can stretch your legs:
    a. *"Now we are going to go for a little walk. We are going to walk around the classroom/lab, walk to the bathroom, and walk to the water fountain so we can stretch our legs a little. Please follow me."* (Start timer)
2. Lead the child around the classroom/lab, out to the hallway, down to the water fountain and bathrooms, and then back to the classroom/lab, where you continue to walk around until 2 minutes has passed.
    a. **45 seconds into walking, say**: *"Remember, we are walking around so we can stretch our legs so let's keep walking!"*
    b. **1:15 minutes into walking, say**: *"Ok, remember that we want to stretch our legs so we are going to keep walking"*
3. If children continue to ask what you are doing, tell them that you are *"just going for a walk so we can stretch our legs a little".*

Tummy Breath: 2 minutes total [~ 2 minutes into training]

1. Unfold Yoga Mat and lay it on the floor. Ask child to lie down on the mat and get stuffed animal and toys:
    a. *"Can you lie down on the mat right here? Great! This is my friend Tabby. He/she likes to rest. You can play with Tabby during this rest period or you can play with the toys in my toy box, but we are going to stay on the mat and play quietly during this time.*
2. **1 minute into task, say**: *"Remember, we are just relaxing on the mat to rest for a little after our walk. Tabby also likes to lay down and rest. We are going to rest until I tell you that our rest time is over."*
3. If child tries to get up, etc., prompt with:
    a. "*Remember, this is rest time after we took such a long walk! Can you keep resting for me? I will tell you when rest time is over."*

Mindful Listening: 2 minutes total [~ 4 minutes into training]

1. Get phone or computer ready to play the Meditation Bell Sound and put toy box on the table.

a. "*I am going to play a sound for you. It is going to be loud at first, and then quiet. I'm going to play the sound for the next few minutes. Ok?"*

b. "*We are going to listen to the sound three times. You can play with any of these toys while we listen to the sound. I will tell you when we are done with the sound."*

2. Start the timer and play the meditation bell sound 3 times.
3. If child asks what the sound is:
    a. *"It's a bell and we are going to listen to it for the next few minutes"*

<u>Gummy Task: 5 minutes total [~ 6 minutes into training]</u>

1. Provide the child with a gummy bear.
    a. "Here is a quick snack you can eat while we continue to play games."
    b. Start the timer once you give them the snack for 5 minutes
2. Then tell them they can keep playing with the toys in the toy box.
    a. "Ok, now you can keep playing with these toys for the next few minutes until we move on to the next game!"
    b. **At 2:30 minutes:** "*Alright, we are going to keep playing for a few more minutes until our next game"*
    c. **At 4 minutes: "***Ok we have one more minute and then we are going to clean up for the next game."*

(Tell them to start cleaning up at 4:45 (10:45min.), finish at 5:00 (11:00) minutes)

APPENDIX D

PARENT QUESTIONNAIRE

Items on the Parent Questionnaire
1. When faced with an accidental or purposeful conflict situation with a peer (non-family member), such as having a toy taken away, being called a bad name, being excluded from play, being pushed, hit or kicked, being made fun of, or someone messing up something they made or built, how often have you observed your child engaging in the following behaviors: hitting, kicking, name calling, yelling, or purposeful exclusion from play.
2. Please indicate how often you have been notified by your child's teacher that one or more of the following behaviors has occurred at school- hitting, kicking name calling, yelling, or purposeful exclusion from play.
3. Please indicate how often you have been notified by another parent that your child engaged in one or more of the following behaviors towards another child- hitting, kicking name calling, yelling, or purposeful exclusion from play.
4. Does your child have a current diagnosis of ADHD?
5. Does your child have any other current mental health diagnoses? If YES, please list:
6. Is your child currently engaged in any evaluative processes for a diagnosis of ADHD or any other mental health diagnosis?