IMPROVING EXECUTIVE FUNCTION DEVELOPMENT: FANTASY-ORIENTED PRETEND-PLAY AS A PROTECTIVE FACTOR

by

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ABSTRACT

Recent research suggests certain abilities (i.e., emotion regulation, appropriate physiological reactivity, executive functions) support the development of school readiness skills, especially among children in low-income environments. Although many preschool curricula have been developed to scaffold school readiness skills in at-risk preschoolers, these curricula are often very costly and require extensive training to implement. In order to improve upon the feasibility and sustainability of these programs, it is important to identify natural environmental experiences that are implicated in normative development. For instance, engaging in pretend-play, which typically involves cooperation, shared affect, and support among peers and adults, likely provides a positive context to scaffold development. The current study investigated how a propensity towards imagination and pretend-play (i.e., fantasy orientation; FO) may serve as a protective factor to minimize deficits in executive functions in a Head Start population (N = 343 children). Results revealed partial support for these hypotheses. Specifically, it appears that cognitive aspects of FO moderate the relationship between emotion regulation and executive function such that better cognitive performance was observed among children with poor emotion regulation skills and a high FO compared to peers who had poor emotion and a low FO. Similarly, behavioral aspects of FO appear to moderate the relationship between physiological reactivity and executive function. Among children who displayed low physiological reactivity, those with a higher FO demonstrated better executive function outcomes than peers who had a low FO. Implications for curriculum development and future directions are discussed.

DEDICATION

It is with great honor that I dedicate this work to my unbelievable parents, Jack and Linda Thibodeau. I am truly blessed to have such caring and supportive parents who have encouraged me not only for the past 4 years, but also throughout my entire academic journey. Dad, thank you for teaching me to always work hard, but to also take time for myself. You have always encouraged me to make decisions based on what was ultimately best for me and have been such a calming presence in life. I have always admired your work ethic and aspire to be as hardworking as you someday. Although Texas Football runs deep in your veins, thank you for putting aside your UT loyalty to become Alabama’s #1 fan! Mom, thank you for fostering my love of research at an early age by having me be your guinea pig in your own studies. You daily inspire me to seek the answers to questions that will improve the lives of others. Of all the academics I know, you have the most caring heart for those who you serve in your research. Most importantly you have taught me that “God will never give me more than I can handle,” that “everything happens for a reason”, and to not “put off until tomorrow what you can do today.” Thank you both for teaching me to keep God and family at the center of everything I do and for your selflessness over the years as you edited my papers, quizzed me on my times tables, and reviewed my 20+ page study guides with me. I would not be where I am today without your unending love, guidance, and support. I hope I have and will continue to make you proud!

LIST OF ABBREVIATIONS AND SYMBOLS

a	Cronbach's index of internal consistency
B	Beta: unstandardized regression coefficient
b	Simple slope value
d	Cohen's *d*: measure of effect size
df	Degrees of freedom
EF	Executive function
ER	Emotion regulation
FO	Fantasy orientation
M	Mean: the sum of a set of measurements divided by the number of measurements in the set
N	Sample Size
n	Group sample size
p	Probability associated with the occurrence under the null hypothesis of a value as extreme as or more extreme than the observed value
r	Pearson product-moment correlation
R^2	R squared: measure of effect size (amount of explained variance)
SCL	Skin-conductance level
SD	Standard deviation: value of variation from the mean
SE	Standard error: statistical accuracy of an estimate, equal to the standard deviation of the theoretical distribution of a large population of such estimates
$\leq$	Less than or equal to

$\geq$	Greater than or equal to
$=$	Equal to
Δ	Change in

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INTRODUCTION

Ever since government officials declared the importance of preparing children for formal schooling nearly two decades ago (National Education Goals Panel, 1995; National Institute of Child Health and Human Development Early Child Care Research Network, 1998), public preschool enrollment has nearly doubled (Barnett, Hustedt, Friedman, Boyd, & Ainsworth, 2007). Despite repeated concerted efforts to enhance school readiness, the emphasis on providing quality preschool educational services remains on our nation's agenda today. In fact, kindergarten teachers report that nearly half of children entering kindergarten experience moderate to difficult transitions, citing "difficulty following directions" and "lack of academic skills" as the most prevalent problems (Rimm-Kaufman, Pianta, & Cox, 2000). These difficulties are especially pronounced among children from low-income families, a population that is of particular interest to the present study. For example, in a survey of over 3,000 kindergarten teachers throughout the United States, Rimm-Kaufman et al. (2000) reported that higher poverty levels predicted more problems with the preschool to kindergarten transition. In addition, children who are raised in low socio-economic status (SES) environments with high rates of marital instability, harsh discipline techniques, and low parental warmth exhibit higher rates of externalizing behaviors than their peers in mid to high SES environments (Conger et al., 1992; Dodge, Pettit, & Bates, 1994). These outcomes are confounded in urban environments where there are high concentrations of "at-risk" children within each school (Hope & Bierman, 1998; Rimm-Kaufman et al., 2000).

Unfortunately, research indicates that children who lack these basic skills upon entering kindergarten not only experience academic and social difficulties during this transition period, but are also more likely to experience peer rejection, drop out of school, experience mental health problems, and engage in dangerous illegal behaviors later in life (Cooper & Farran, 1988; Goal One Ready Schools Resource Group, 1995; McClelland, Morrison, & Holmes, 2000; Shonkoff & Phillips, 2000). Even more concerning is the fact that a large majority of pre-kindergarten child care centers are providing, at best, mediocre services to preschool-aged children (Cost, Quality, and Child Outcomes Study Team, 1995). In fact, Rous and colleagues (2010) have shown that on average, teachers use less than half of the transition practices at their disposal, with this low rate being especially pronounced among teachers in high-poverty schools.

The gravity of the outcomes, combined with recent statistics showing that the number of children enrolling in federally funded preschool education for low-income families is steadily increasing (Rous et al., 2010), highlight the need to identify mechanisms to enhance children's school readiness at an early age. School readiness encompasses development across many domains including, but not limited to, physical, social, emotional, and cognitive domains (National Education Goals Panel, 1998). Given that kindergarten teachers consistently report "difficulty following directions" and "lack of academic skills" as the two most prevalent problems in the preschool to kindergarten transition (Rimm-Kaufman et al., 2000), it is clear that readiness research should focus on enhancing children's academic and social skills prior to entering kindergarten.

Two main approaches to facilitate school readiness and close observed achievement gaps have been studied. The first approach is to directly train specific skills (e.g., emergent literacy and numeracy skills) to enhance various aspects of school readiness (e.g., reading and math achievement; Duncan et al., 2007; Lonigan, Burgess, & Anthony, 2000). A second, developmental approach emphasizes training more domain-general skills that support the development of not only domain-specific processes (e.g., emergent literacy and numeracy skills; McClelland et al., 2007), but also the mental processes involved in reading and math skills (Fuchs et al., 2005; Passolunghi, Vercelloni, & Schadee, 2006; Swanson & Sachse-Lee, 2001; Welsh, Nix, Blair, Bierman, & Nelson, 2010). Recent research has identified a set of cognitive abilities called executive functions (EFs) which appear to aid in the development of both domain-specific and school readiness skills. This set of domain-general cognitive skills and their relation to school readiness is reviewed below.

Executive Functions

Defining Executive Functions

Executive functions are higher-order thinking processes that allow individuals to override automatic thoughts and behaviors in favor of more adaptive, goal-directed responses (Carlson, 2005). Some of the most important cognitive processes included under the umbrella term of EFs are working memory, inhibitory control, and cognitive flexibility (Miyake et al., 2000; St. Clair-Thompson & Gathercole, 2006). Working memory is defined as the temporary storage of information, which allows individuals to manipulate information as they cognitively process it (Baddeley, 1983; Baddeley, 1992). Inhibitory control refers to one's ability to suppress an automatic, prepotent response (Stroop, 1935; Wright, Waterman, Prescott, & Murdoch-Eaton, 2003), and can be divided into two main types: behavioral inhibitory control and cognitive inhibitory control. As their names imply, behavioral inhibitory control involves suppressing automatic behavioral responses (Kochanska, Murray, Jacques, Koenig, & Vandegeest, 1996), such as inhibiting the act of eating a piece of candy until given permission, whereas cognitive inhibitory control is the ability to suppress internal thoughts and cognitions. Finally, cognitive flexibility, also referred to as attention shift, refers to an individual's ability to shift their attention back and forth between two different domains (Monsell, 1996).

Interestingly, research indicates that although these cognitive processes comprise distinct components of EF, they also share common underlying features and are highly related (Miyake & Freidman, 2012; Miyake et al., 2000). That is, the components that make up EFs display both unity and diversity (Miyake & Freidman, 2012; Miyake et al., 2000). Although this pattern is seen in adolescence and adulthood, in early childhood the domains of EF are highly integrated and not easily teased apart (Carlson, Moses, & Breton, 2002; Diamond & Taylor, 1996; Hughes, Ensor, Wilson, & Graham, 2010; Wiebe, Epsy, & Charak, 2008; Wiebe et al., 2011). Specifically, Wiebe and colleagues (2008) utilized confirmatory factor analysis to compare various models of executive processing in 2-3 year olds in order to determine if the components that comprise executive control (i.e., working memory and inhibition) are more domain-specific or domain-general in young individuals. These authors found that a single-factor model adequately explained the data. Although tasks of working memory and inhibitory control have distinct characteristics on a surface level, Wiebe et al. (2008) concluded that tasks of working memory and inhibitory control seem to measure a single cognitive ability in preschool aged children.

Expanding upon their previous research, Wiebe and colleagues (2011) performed another study using confirmatory factor analysis in a sample comprised of only young preschoolers (i.e., 3-year-olds). It is crucial to explore the structure of EFs in this age range, as 3 years of age is pivotal for the development of EFs (Diamond & Taylor, 1996). Prior to their study, analyzing the domains of executive control in young children proved difficult due to the lack of EF tasks suitable for this age group. However, with the development of more age appropriate measures of EF, Wiebe and colleagues (2011) were able to examine the relationships among several measures of working memory, inhibitory control, and cognitive flexibility. Similar to the results above, Wiebe et al. (2011) found that a single latent EF factor best modeled the data in this young population, with other research supporting this conclusion (Hughes et al., 2010).

Although EFs are measured in research using tasks that measure it globally as well as tasks that measure a single aspect of EF (e.g., working memory), it is very rare for a child to be presented with a situation that only requires the use of one EF in non-research settings. For example, children are often asked by parents and teachers to do various tasks at one time such as pick up your toys, put them in your room, and wash your hands before supper. Doing so requires a child to actively engage not only their working memory system (to remember the three instructions they were given), but also their attentional and inhibitory control systems (to stay focused on the tasks at hand rather than sitting down to play with another toy). These domains are highly integrated in real life and not easily teased apart.

The ability to perform tasks that require multiple EFs (e.g., the ability to hold two rules in mind while also inhibiting a prepotent response) improves between 3-6 years of age (Diamond & Taylor, 1996). The “Day-Night” task is a great example of this phenomenon. In this task, children are instructed to say the word “day” when shown a picture of the moon and to say the word “night” when shown a picture of the sun (Gerstadt, Hong, & Diamond, 1994). Not only does this task require the inhibition of a prepotent response to name what they see, but it also requires that children hold the instructions and rules in their working memory. Interestingly, 3 ½ to 4 ½ year olds experience difficulty in completing this task whereas 6 to 7 year olds are able to complete this task without much trouble. However, when the task is manipulated so that it only taxes one component of EF, performance in younger children improves (Diamond, Kirkham, & Amso, 2002). Specifically, Diamond and colleagues (2002) instructed children to say “dog” when shown the picture of the moon and “pig” when shown a picture of the sun. Thus, children only had to use their working memory to remember the rules and no longer had to inhibit a prepotent response as the words they were instructed to say were unrelated to the pictures presented. In doing so, these children performed significantly better on this task than when it was presented in the standard format.

Despite these results, testing just one domain of EF may not lend externally valid results given that the domains of EF are highly integrated and that children are often presented with situations that require multiple EFs in daily life. Although each EF measure may not be individually predictive of a child’s EF abilities, a large battery that tests multiple domains of EFs can provide a more accurate and externally valid depiction of a child’s cognitive abilities.

The Importance of Executive Functions for School Readiness

Many aspects of EFs can be observed as children complete everyday academic and social tasks. For example, as a child is learning to recite their ABC’s, they will have to use their working memory to cognitively process new letters and their sequence in the alphabet. They may also have to shift their attention between multiple domains to learn where the letter lies in the alphabet, what it looks like, how it sounds, and how it is similar to and different from other letters they have previous learned. Similarly, as teachers give children directions such as pick up your toys, put them away, and wash your hands before lunch, a child must actively engage not only their working memory system (to remember the three instructions they were given), but also their attentional and inhibitory systems to sustain attention (to stay focused on the tasks at hand rather than sitting down to play with another toy).

Empirical research also supports an association between EFs and school readiness skills. For example, EFs predict social competence among Head Start preschoolers such that children with better EFs display higher levels of social competence (Bierman, Nix, Greenberg, Blair, & Domitrovich, 2008). In addition, in a study of over 140 children enrolled in Head Start federally funded preschools for low income families, Blair and Razza (2007) found that EFs predicted children's math, language, and literacy abilities in kindergarten beyond what could be attributed to their general intelligence. Working memory and attentional control skills in early elementary school have also been found to be related to school readiness skills (e.g., math ability; Passolunghi et al., 2006).

More recently, Welsh and colleagues (2010) used a longitudinal paradigm to investigate the development of EF and school readiness skills and their relationship to one another throughout the preschool and kindergarten years. In a sample of 164 low-income children identified as "at-risk" for poor school readiness and attending government funded Head Start programs, Welsh et al. (2010) found that domain-general EF skills were highly correlated with more domain-specific skills including literacy and numeracy skills. Furthermore, a child's EF development from the beginning to the end of the pre-kindergarten year predicted both their reading and math achievement after controlling for domain-specific skills (i.e., emergent literacy and numeracy ability) and language ability.

The Development of Executive Functions in the Context of Poverty

Despite the benefits of enhanced EFs on school readiness, research indicates that EF abilities do not automatically develop and mature over the lifespan (Center on the Developing Child at Harvard University, 2011). Rather, various aspects of a child's environment appear to play a crucial role in their EF development (Blair, 2006; Ceci, 1991; Cicchetti, 2002). For example, children raised in poverty experience many daily stressors including family discord and low parental involvement and warmth (Ladd & Pettit, 2002; Magnuson & Duncan, 2002). These stressors (i.e., low maternal sensitivity, maternal intrusiveness, unsafe/chaotic household environment) in turn predict poor EF skills (Blair et al., 2011). Research demonstrates that children raised in low-income environments not only display lower rates of school readiness (Rimm-Kaufman et al., 2000), but they also tend to exhibit deficits in EF skills such as working memory and cognitive, attentional, and behavioral control (Evans, Schamberg, & McEwen, 2009; Goldsmith & Rogoff, 1997; Lengua, Honorado, & Bush, 2007; Li-Grinning, 2007). Thus, it is important to consider ways to facilitate EF development among at-risk children, such as those attending federally funded Head Start preschools.

Executive Function Training Programs. It is generally understood that EF skills are malleable during early developmental periods (Blair, 2016; Diamond & Lee, 2011). Just as we observe changes (i.e., impairments) in EFs when children are placed in aversive conditions, we also expect to observe changes (i.e., growth) in EF skills when children are placed in adaptive conditions (Blair, 2016). Numerous programs designed to train EF skills are cited throughout the literature and can be divided into two approaches: direct EF training and indirect EF training (Bergman Nutley et al., 2011; Bialystok, 1999; Bialystok, 2011; Bialystok & Martin, 2004; Blair, 2016; Bodrova & Leong, 2007; Diamon & Lee, 2011; Domitrovich, Greenberg, Kusche, & Cortes, 1999; Klingberg, 2010; Lillard et al., 2013; Thorell, Lindqvist, Bergman Nutley, Bohlin, & Klingberg, 2009).

Direct Executive Function Training. Direct EF training programs typically focus on getting individuals to repeatedly practice certain EF skills, such as inhibitory control or working memory (Blair, 2016; Klingberg, 2010). The purpose of these direct training programs is solely to increase performance on the particular task/skill at hand. For example, computer-based training programs utilizing CogMed ©, a software that aims to increase working-memory demands, have been empirically studied as a direct EF training program in preschool aged children (Bergman Nutley et al., 2011; Lillard et al., 2013; Thorell et al., 2009). Although 4-year-olds who underwent five weeks of working memory training using the CogMed program displayed improvements in working memory beyond preschoolers in control groups, these effects did not necessarily generalize to other EF skills, such as problem solving (Bergman Nutley et al., 2011; Thorell et al., 2009). Computer programs aimed at specifically improving inhibitory control skills produced similar results. Specifically, 4- to 5-year-old children who participated in five weeks (15 min/day) of inhibitory control games showed improvements on two of the three practiced games when compared to children in a control group (Thorell, et al., 2009). However, these improvements did not transfer to non-practiced inhibitory control tasks (Thorell et al., 2009). Because of these poor transfer effects commonly found among direct EF training programs, researchers have recently turned their attention to more indirect methods for facilitating the development of EFs in early childhood (Blair, 2016).

Indirect Executive Function Training. Many programs, ranging from school curricula to physical activities such as yoga, martial arts, and aerobics (Diamond & Lee, 2011), have been developed to indirectly train EF skills. These programs do not directly train EF skills, but rather incorporate activities that are designed in such a way that engaging in these activities naturally exercises EFs (Blair, 2016). For example, there is evidence that bilingualism, which requires cognitive flexibility to switch between languages, relates to the development of EF abilities in children (Bialystok, 1999; Bialystok, 2011; Bialystok & Martin, 2004). Specifically, when compared to monolingual children, bilingual children between the ages of 4 and 5 years are more successful at shifting between dimensions on a dimensional-change card-sort task (Bialystok, 1999; Bialystok & Martin, 2004). In addition, bilingual individuals out-perform their monolingual counterparts on measures of cognitive inhibition (i.e., Stroop task; Bialystok, Craik, & Luk, 2008). Training children to improve their bilingual skills likely exercises their EFs and thus indirectly facilitates EF development. Unlike direct EF training, the goal of indirect training is not to increase EF performance on a particular task but rather to increase performance on the behaviors of interest to the program (e.g., bilingual ability).

Most of the studies investigating the effects of these programs on EFs have been conducted with school-aged children (i.e., age 5-13; Diamond & Lee, 2011). However, recent attention has turned to developing preschool curricula that indirectly train EF skills in early childhood (i.e., ages 3-5) through activities like reading, play, and emotion regulation training (e.g., Bodrova & Leong, 2007; Domitrovich et al., 1999). Numerous randomized controlled trials of curricula that teach children about emotions and how to appropriately regulate them (e.g., Promoting Alternative THinking Strategies – PATHS and Tools of the Mind) have consistently highlighted the effectiveness of training emotion regulation skills as a means to indirectly facilitate EF development in preschool aged children (Bodrova & Leong, 2007; Domitrovich et al., 1999). Before discussing these programs in detail, it is important to define emotion regulation and distinguish it from EF skills.

Emotion Regulation

Defining Emotion Regulation

Emotion regulation (ER) is typically thought of as the processes that help an individual monitor, evaluate, and modify their emotional responses, both positive and negative, so that these responses are in line with what is appropriate in a given situation (Eisenberg, Hofer, &

Vaughan, 2007; Gross & Thompson, 2006; Thompson, 1994). These skills are important for relational, academic, and occupational success throughout childhood and adulthood (Shipman, Schneider, & Brown, 2004). Emotion regulation can occur both intrinsically (e.g., modulating your own emotional arousal) or extrinsically (e.g., a friend lending a sympathetic ear to help you regulate your emotional reaction to a situation, or a parent relieving the emotional distress of their infant; Thompson, 1994). Although ER is typically conceptualized as the processes involved in inhibiting or dampening negative emotional arousal, it is important to note that ER also involves the maintenance or enhancement of emotions where appropriate (e.g., increasing arousal in response to something positive or exciting; Thompson, 1994).

In a review of ER abilities, Westphal and Bonanno (2004) discussed that ER behaviors lend themselves to being categorized into three distinct groups, with the ultimate goal of each being to maintain an emotional homeostasis. The first category of ER is known as Control Regulation. This type of response-focused regulation involves maintaining emotional homeostasis through the modification of an emotional response once an emotion or reaction has already manifested (Gross & Thompson, 2006). For example, an individual may engage in Control ER when someone else gets something they want (e.g., an award). Although this person may immediately feel upset, they must alter their emotional response so that it is in line with what is appropriate for that particular situation (e.g., being happy for their other person), thus maintaining their emotional homeostasis.

The second category of ER is referred to as Anticipatory, or antecedent-focused, Regulation and involves controlling emotions before they are generated (Gross & Thompson, 2006; Westphal & Bonanno, 2004). In other words, individuals engaging in Anticipatory Regulation do not have an immediate need to alter their existing emotional state, but rather a need to identify strategies to maintain emotional homeostasis for anticipated challenges. For example, Anticipatory ER can be observed when individuals avoid seeking out certain situations or people that they know will make them anxious or angry.

The final category of ER is called Exploratory Regulation. Westphal and Bonanno (2004) suggest that there are certain behaviors that naturally help to scaffold skills to maintain emotional homeostasis during times when individuals do not need to engage in either Control or Anticipatory ER. Specifically, when individuals watch emotionally arousing movies or read emotionally arousing novels, they have an opportunity to observe individuals working through various situations and thus gain insight into adaptive ways of coping with the depicted emotions. Westphal and Bonanno (2004) suggest that people may even imagine themselves as the characters in the story, thus facilitating their ability to experience and learn about regulating various emotions in a safe context. Exploratory ER is likely experienced by children during imaginative play in which they are provided with a safe context to encounter emotionally arousing situations they would not normally experience in their everyday lives (e.g., interacting with aliens on the moon). Interestingly, Westphal and Bonanno (2004) point out that Exploratory ER may be most prevalent among young children due to the fact that it requires fewer sophisticated cognitive abilities than Control Regulation and Anticipatory Regulation, which both require the integration of past and current information to come up with an adaptive solution for maintaining emotional homeostasis.

The Development of Emotion Regulation

Throughout infancy and into toddlerhood, ER occurs largely outside of conscious awareness (Blair, 2016). Although infants come into the world predisposed with some abilities to regulate emotional and physical discomfort (e.g., non-nutritive sucking, eye closing, head turning; Kessen & Mandler, 1961), children initially rely heavily on parental support to modulate their emotional response. In other words, ER is fundamentally extrinsic in early infancy and toddlerhood and is considered to be non-effortful (Gross & Thompson, 2006; Kopp, 1989; Thompson, 1994). Parental influence on ER is evident across a wide range of ER strategies. For example, parents create daily routines and select situations that are not too emotionally demanding for their infant or child, provide assistance to their child when they engage in a challenging and frustrating task, encourage their child to focus their attention on something other than the emotionally arousing stimulus, and help their child focus on the positive aspects of a situation through cognitive reappraisal (Gross & Thompson, 2006). In doing so, parents are inherently modeling acceptable emotional expression for their children (Lewis & Michalson, 1983).

Over time, as children learn from their parents how to appropriately regulate their emotional responses in various contexts, ER becomes a more cognitively controlled and intentional process (Sroufe, 1996). For instance, throughout development children begin to understand that they can relieve their own distress by playing with an interesting toy or seeking out a soothing blanket (Kopp, 1989). Interestingly, these explicit forms of ER begin to manifest in tandem with the maturation of various brain structures that are also implicated in the development of cognitive control (Bronson, 2000).

Differentiating between Emotion Regulation and Executive Function

Emotion regulation and cognitive control skills, such as EFs, develop concurrently as well as interdependently (Blair, 2016). Before describing their interdependence, it is important to differentiate between ER and EF. Throughout the literature, the skills underlying both ER and EF are often conflated. For example, in the well know “marshmallow task” developed by Mischel

(1996), one can observe children engaging in a variety of self-regulation techniques including, but not limited to, looking away from the marshmallow or distracting themselves from thinking about the marshmallow. Very similar techniques may also be implemented in emotion regulation (e.g., attentional deployment; Gross & Thompson, 2006).

Interestingly, EFs and ER follow similar developmental trajectories (Carlson & Wang, 2007). For example, Diamond and Taylor (1996) studied inhibitory control abilities of 160 children ranging from 3.5 to 7 years of age using the "Day-Night" task and found that performance on measures of inhibitory control increase among children between the ages of 3 ½ and 6. Similarly, various researchers have found that ER abilities markedly improve during the preschool years, with children transitioning from openly expressing their negativity to engaging in various ER strategies to minimize their negative feelings (Cole, 1986; Garner & Power, 1996; Josephs, 1994; Liew, Eisenberg, & Reiser, 2004).

Despite the similarities between these two constructs, researchers consistently acknowledge that EF and ER are separable processes that develop in tandem and have a recursive influence on one another (Blair, 2002; Blair, 2016; Kopp, 1989). As stated earlier, early in life infants exhibit ER abilities (e.g., sucking, gaze aversion) that are largely automatic and outside of conscious control (Kessen & Mandler, 1961). Developmental theory suggests that these less intentional behaviors give rise to more complex intentional processes (Blair, 2016). As the brain develops and matures, toddlers gain the ability to consciously control their attention thus leading to more intentional ER strategies (Cole, Martin, & Dennis, 2004; Ursache, Blair, Stifter, Voegtline, & The FLP Investigators, 2013). In other words, the development of EF skills allows ER to become more intentional (e.g., a child understanding that they are able to shift their attention from a distressing stimulus and instead play with an interesting toy to minimize their distress). In turn, as children gain experience appropriately regulating their emotions, they are naturally engaging in and facilitating EF skills (Blair, 2002; Kopp, 1989).

Because of the considerable overlap between these two constructs, it is especially important to delineate between ER and EF through the measures chosen for research purposes (Zelazo & Cunningham, 2007). The objectives of the measures chosen to tap EF should be clearly different from the objectives of measures chosen to assess ER. For example, in the "marshmallow task" discussed above, there is a clear difference between waiting to eat the marshmallow until the researcher returns, and waiting to eat the marshmallow with regulated emotions (Kopp, 1989). If the primary objective of this task is to see if a child does not eat the marshmallow until the experimenter returns, this task can be conceptualized as an EF task. However, if the primary objective of the task is to examine a child's control of emotional responses during the waiting period (e.g., putting their head on the table, making a sour face), then this task could be conceptualized as an ER task.

The Relationship between Emotion Regulation and Executive Function

When observing how ER manifests throughout childhood, it is clear to see that ER and EF are closely linked. For example, if a toy is taken from a child by one of their peers, a child will likely experience a fairly automatic negative emotional response due to what the child may perceive as a threat or challenge to their well-being (Barrett & Campos, 1987). However, becoming outwardly upset and engaging in aggressive, retaliatory behaviors is socially unacceptable. As parents and teachers socialize children to control their automatic negative emotions and respond in more socially appropriate ways, children naturally engage their EFs such as inhibitory control (Saarni, Mumme, & Campos, 1998).

Interestingly, extant research demonstrates a relationship between children's ER and EF skills (*r*'s = .25-.62; Carlson & Wang, 2007; Kieras, Tobin, Graziano, & Rothbard, 2005; Kuhn et al., 2014; Liberman, Giesbrecht, & Muller, 2007; Ursache et al., 2013). In a study of preschool children between 4 and 6 years of age, Carlson and Wang (2007) found that children's ability to regulate their emotions (e.g., controlling their negative reaction to a disappointing gift) was correlated with their inhibitory control skills (e.g., not touching a toy while an experimenter leaves the room). Although emotions may play a role in performance on both of these tasks, these authors conceptualized the disappointing gift task as a measure of ER because the primary goal of this task was to control emotional expression. By contrast, the forbidden toy task was conceptualized as a measure of inhibitory control because the primary goal was to control motor activity, thus leaving emotional control as secondary to the primary goal. Results revealed that children who could regulate and dampen their negative reaction to a disappointing gift exhibited better inhibitory control skills. These results remained consistent even after controlling for age and verbal ability and were corroborated by parent reports of their child's ER and EF skills. Similar results have been found among other studies (Kieras et al., 2005; Liberman et al., 2007).

More recently, longitudinal studies have demonstrated that ER abilities in infancy predict children's EF skills later in preschool (Kuhn et al., 2014; Ursache et al., 2013). In one particular study, Ursache and colleagues (2013) induced emotional reactivity in 15-month-old infants from low-income backgrounds by exposing them to a scary mask. The authors coded for negative reactivity upon exposure to the mask (e.g., furrowed brow, crying, closing of the eyes, screaming) as well as regulation behaviors after exposure to the mask (e.g., looking to mother, neutral vocalizations, avoidance behaviors). At four years of age, these same children were tested again for their EF abilities using a battery of age-appropriate tasks assessing working memory, inhibitory control, and attention shift. When examining how emotional reactivity and regulation in infancy predict EF skills in preschool, Ursache et al. (2013) found an interesting interaction between reactivity and regulation such that high levels of reactivity coupled with high ER predicted enhanced EF whereas high reactivity coupled with low ER predicted poor EF. Executive functions were not impacted among children who had low levels of reactivity, regardless of their regulation abilities. These results held constant after controlling for parental education/income and child sex/race.

Directionality of the Relationship between Emotion Regulation and Executive Function

Despite the complex association between ER and EF, it is important to note the correlational nature of the aforementioned findings, which leave open questions regarding the directionality of this relationship. Two possibilities exist. First, it is possible that EF skills are a necessary precursor to ER, such that a child cannot successfully regulate their emotions without first acquiring EF skills (e.g., inhibitory control, working memory). Although EF and ER skills develop in an interrelated manner (Blair, 2002; Blair, 2016; Kopp, 1989), we do not have direct evidence that training EF skills leads to improvements in ER. Rather, training EFs typically leads to poor transfer effects even among EF skills (Bergman Nutley et al., 2011; Thorell et al., 2009). An alternative possibility is that ER supports the development of EF abilities. In support of this stance, experimental studies of emotion-focused interventions demonstrate that training appropriate emotional responses leads to improvements in children's EFs (Bierman & Torres, 2014*;* Domitrovich et al., 1999; Greenberg, 2006). In fact, many preschool intervention programs focus on scaffolding socio-emotional regulation skills to support development across many domains (Bodrova & Leong, 2007; Clements & Sarama, 2007; Domitrovich et al., 1999; Schickendanz & Dickinson, 2005). These interventions are outlined below.

School Readiness Interventions

Ever since researchers have discovered the importance of school readiness, many preschool curricula have been developed to help facilitate children's learning and development in preschool. Although some programs, such as Opening the World of Learning (OWL) and Building Blocks, take a domain-specific approach in which early literacy and numeracy skills are specifically targeted (Clements & Sarama, 2007; Schickendanz & Dickinson, 2005), other programs train more domain-general skills such as EF, pretend-play, and ER with the idea that training these skills will in turn lead to general improvements in school readiness. For example, a Vygotskian classroom intervention known as Tools of the Mind has been implemented as an intervention to facilitate EF development (Bodrova & Leong, 2007; Lillard et al., 2013). This program has three main components that are performed on a daily basis: self-regulation, reading, and pretend-play. Another domain-general intervention that has led to improvements in both EF and school readiness is Promoting Alternative THinking Strategies (PATHS; Domitrovich et al., 1999). This particular school readiness intervention focuses on scaffolding socio-emotional regulation skills to support development across many domains. Experimental studies of the PATHS emotion-focused intervention demonstrate that training appropriate emotional responses leads to improvements in children's emotion knowledge, social competence, levels of aggression, and EFs (Bierman et al., 2008; Bierman & Torres, 2014; Domitrovich et al., 1999; Domitrovich, Cortes, & Greenberg, 2007; Greenberg, 2006).

The Problem with Current School Readiness Intervention Programs. Although many programs have targeted domain-specific and domain-general skills to improve cognitive function and school readiness, these programs are often very costly and require extensive training to implement. In addition, the complexity of these programs often places additional burdens on the preschool teachers leading to poor implementation fidelity and thus poor sustainability (Weiland & Yoshikawa, 2013). In order to improve upon the sustainability of existing school readiness programs, it is important to identify natural environmental experiences that may help children who have poor emotion regulation skills reach their full socio-emotional and cognitive potential. This may be especially important for low-income preschools that lack resources for materials and training, such as Head Start preschools.

Pretend-Play as a Mechanism of Change

As Vygotsky theorized, complex sociodramatic play may also provide a natural environmental experience in which cognitive and social skills can be developed (Vygotsky, 1967; Vygotsky, 1978). In support of this stance, research indicates that children who engage in high levels of pretend-play are more likely to get along with their peers (Singer & Singer, 1981; Singer & Singer, 1990), to have improved perspective taking and theory of mind skills (Lillard, Pinkham, & Smith, 2011; Taylor & Carlson, 1997), to be rated as popular by their peers, and to demonstrate socially competent behaviors (Black, 1992).

The benefits of pretend-play also extend beyond social abilities into the cognitive domain. Given that the act of engaging in imaginary play and having imaginary companions requires that children switch back and forth between fantasy and reality (Estes, Wellman, & Woolley, 1989; Golumb & Kuersten, 1996) and thus use working memory to remember pretense rules and scripts, inhibit using pretense scripts in real life, and shift attention back and forth between reality and pretense, it is logical that pretend-play would be related in some fashion to EF development. Sound empirical evidence of a relationship between pretense and EF has recently emerged. Specifically, Pierucci and colleagues (2014) interviewed preschoolers between the ages of 4 and 6 using measures of EF and pretense. After a series of regression analyses, Pierucci and colleagues found that children with a high propensity towards imagination and pretend-play (i.e., engaging in imaginative cognitions, belief in imaginary entities) displayed better cognitive inhibition and attention shift than children exhibiting low and moderate propensities towards pretend-play. Carlson and colleagues (2014) also found positive correlations between EFs and the understanding of pretend versus reality as well as the ability to perform pretend actions among preschool children.

Work has also been done to move beyond correlational designs to experimentally examine the directionality of the observed relationship between pretense and EF development. As alluded to earlier, one of the underlying features of the Tools of the Mind curriculum is the idea that play can scaffold learning and EF development (Bodrova & Leong, 2007). However, the type of play encouraged in the Tools curriculum is strongly rooted in pretense (e.g., playing house) and is very structured. For example, children are often assigned a role from which they cannot deviate during the play. This type of structured pretense-based play may not evoke the same cognitive benefits as more child-driven, fantastical pretend-play (Pierucci et al., 2014; Thibodeau, Gilpin, Brown, & Meyer, 2016). Furthermore, among empirical studies of the Tools of the Mind curriculum, researchers were unable to separate the effects of pretend-play from the other aspects of the program (i.e., self-regulation and reading) to know if pretend-play caused the observed increases in EF performance.

In a recent randomized controlled trial, Thibodeau and colleagues (2016) were able to improve upon the aforementioned limitations in order to demonstrate the direct effects of fantastical pretend-play on children's EF development. Groups of preschoolers participated in either a fantastical pretend-play, non-imaginative play, or business-as-usual control condition for 15 minutes a day for five weeks. Thibodeau and colleagues (2016) found that children who participated in the fantastical pretend-play intervention showed improvements in EFs whereas children in the other two conditions did not, suggesting that engaging in fantasy-oriented play may be one of many ways to directly enhance EF development. Interestingly, children in the fantastical pretend-play condition who engaged in higher levels of fantasy-oriented play (e.g., interacting with aliens on the moon) performed better on post-test measures of EF than children in the fantastical pretend-play condition who engaged in more realistic pretense-based play (e.g., pretending to have a meal, playing house), suggesting that a fantasy component of pretend-play was driving the observed benefits.

Development of Pretend-Play

Interestingly, play changes throughout development and follows a consistent timeline across children (Carlson & Zelazo, 2008). For example, early in life (i.e., 2 years old) children are able to give living characteristics to nonliving objects like stuffed animals (Carlson, White, & Davis-Unger, 2014). At this age, children are also able to transform objects and use them for purposes other than their intended use (e.g., pretending a banana is a phone; Carlson et al., 2014). Eventually, as children enter the preschool years, their play becomes more abstract and less dependent on actual objects or props. For example, children at this age will pretend to bounce an imaginary ball or pretend to cook and eat an imaginary meal. Because they are able to utilize abstract concepts in their play, children at this age often enrich their play with fantastical themes.

Fantasy Orientation. The term fantasy orientation (FO) refers to a child’s propensity to play in a fantastical realm and is often operationalized in children as the extent to which they engage in imaginary play and whether or not they have imaginary companions (Taylor, 1999). Research demonstrates that by three years of age, children are able to understand the concept of fantasy, differentiating fantasy from reality (Woolley & Wellman, 1990). Therefore, studies of FO can be conducted in children as young as 3 years old.

It is important to distinguish between fantastical pretend-play and FO. Fantastical pretend-play involves children engaging in imaginative behaviors and cognitions, sometimes as a result of instruction by a parent/teacher or following the lead of an adult/peer. Children who engage in these imaginative behaviors and cognitions consistently and of their own volition are considered high in FO because they are naturally oriented to this type of play and involve other fantastical elements in their everyday life (e.g., imaginary companions, selecting toys, games, and media with fantastical/imaginative elements). In other words, FO likely leads to consistent patterns of how a child engages in their world with highly fantasy-oriented children often incorporating fantastical-themes throughout their daily routines. For example, as a mother is driving her child around town and they happen upon a construction zone, a highly fantasy-oriented child may suggest that he/she thinks they are building a pixie-dust factory whereas a child low in FO is more likely to suggest that they are building a grocery store.

To be clear, children high in FO often engage in fantastical pretend-play. Children low in FO are still able to engage in these imaginative behaviors and cognitions, although they may not do it as often or of their own accord. In other words, FO is a unique way to measure a child's natural proclivity towards complex, fantastical pretend-play. In a study of 152 preschoolers, Taylor and Carlson (1997) found that one-third of their sample could be classified as high FO.

Components of Fantasy Orientation. In play literature, FO is typically conceptualized as being composed of several different components (Brown, Thibodeau, Pierucci, & Gilpin, *in press*; Pierucci et al., 2014; Thibodeau et al., 2016). Using a Principal Component Analysis (PCA) with varimax rotation, previous literature has found four FO constructs: FO cognitions, FO toys and games, FO entities, and FO pretense (Brown et al., *in press*; Pierucci et al., 2014; Thibodeau et al., 2016). As their names imply, FO cognitions assesses the fantastical nature of children's thoughts and FO toys and games assesses the level of fantasy involved in a child's favorite toy, game, and story. FO entities examines whether a child believes in imaginary entities (e.g., Santa Claus, imaginary friends) and FO pretense examines whether or not a child engages in various pretending behaviors (e.g., pretending to be an animal). Each of these components contributes a unique aspect to the FO construct and are conceptually independent. Thus, FO may be considered a form latent variable, rather than a traditional reflective variable, as each of the sub-constructs together form this latent construct (Kenny, 2011).

***Stability of Fantasy Orientation*.** It is important to note that FO is thought to be a stable trait that manifests early in childhood and persist perhaps even into adulthood (Fehr, 2017; Pierucci et al., 2014; Thibodeau et al., 2016). For example, the incidence rates of high fantastical thinking are consistent in childhood and adulthood (Woolley, 1997). Fantasy is also measured as part of the Openness personality trait, which is stable across the lifespan (McCrae 1987; McCrae, 1993). Recent research supports the idea that FO is a stable trait. Specifically, Thibodeau and colleagues (*under revision*) found a positive relationship between FO scores (i.e., retrospective childhood reports and current adult reports) and the Openness to Experience subscale of the Big-5 among college students. In addition, in Thibodeau et al.'s (2016) randomized controlled play intervention, they did not observe any changes in children's FO throughout the course of the intervention despite observed changes in other areas (e.g., cognitive control). Although they speculate that FO is a stable trait, Thibodeau and colleagues suggest that encouraging children to engage in highly fantastical pretend-play on a consistent basis may create a positive context in which various skills can be developed, such as EFs. More recently, Fehr (2017) has demonstrated that pretend-play skills, assessed through observations of standardized free-play sessions, remain consistent over a one month time period.

Pretend-Play as a Positive Context

Arguably, children from low-income families, such as those included in the present study, are likely to experience more negative environmental contexts than their peers due to the family discord and low parental involvement and warmth that is characteristic of low-income settings (Conger et al., 1992; Dodge et al., 1994; Ladd & Pettit, 2002; Magnuson & Duncan, 2002). On the other hand, pretend-play is conceivably an enriching childhood activity (Black, 1992; Lillard et al., 2011; Singer & Singer, 1981; Singer & Singer, 1990; Taylor & Carlson, 1997; Thibodeau et al., 2016) that may provide a positive context to scaffold development. For example, pretend-play is often characterized by cooperation (e.g., children working together to run a pretend-restaurant), shared affect (e.g., a teacher and child both expressing excitement as they imagine a fairy in the classroom), support (e.g., a child asking a friend to help feed their baby-doll as they make dinner for their pretend family), and skill development (e.g., children engaging in behaviors that are developmentally challenging). Therefore, as at-risk children spend more time engaging in pretend behaviors and cognitions, they are likely experiencing a positive context that may compensate for the negative environmental experiences they encounter on a day-to-day basis. We can think of this as analogous to the buffering effects of parental warmth and sensitivity (e.g., Ursache et al., 2013). Thus having a high FO, or a natural proclivity towards engaging in enriching pretend behaviors and cognitions, may minimize the negative effects of poor emotion regulation on cognitive performance. See Figure 1 for conceptual model.

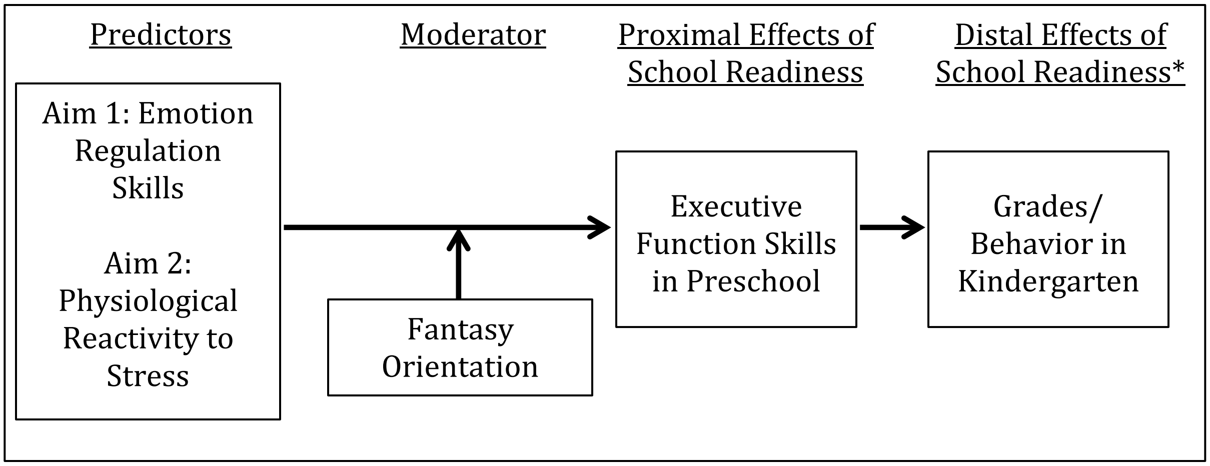

Figure 1. Conceptual Model of Proximal and Distal Effects. *Distal effects will not be investigated in the proposed study but will be available in 2018 for additional analyses.

Aim 1 of the Present Study

The first aim of the current study was to investigate whether FO serves as a moderator in the relationship between ER and EF. Given the positive nature of pretend-play, it is possible that a high propensity towards imagination and pretend-play (i.e., high FO) may serve as a protective factor for low-income children who exhibit deficits in ER skills as a result of the stressors associated with poverty (Raver, 2003). Therefore, it was hypothesized that FO would moderate the relationship between ER and EF such that better EF performance would be observed among children who were low in ER but high in FO whereas EF performance would remain poor among children who were low in ER and low in FO. Similar to the results obtained by Ursache and colleagues (2013), I did not expect to see any significant changes in EF performance among children who were exhibiting mid to high ER, regardless of their level of FO. See Figure 2.

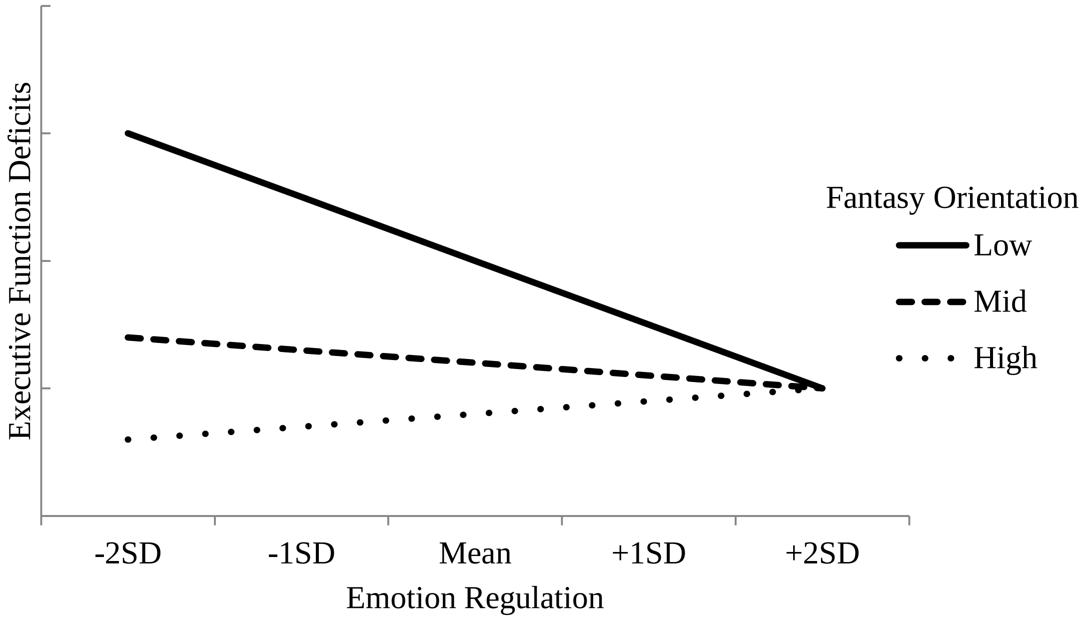

Figure 2. Hypothesized interaction between FO and ER on EF.

Aim 2 of the Present Study

Due to the limitations of self-report research (i.e., response bias), it is becoming increasingly important to identify objective measures that are sensitive to individual differences such as physiological measures. Interestingly, one's ability to control their physiological response to stress has been suggested to be a biological foundation for ER (Porges, 2007). Children experience various stressors (both positive and negative) on a daily basis (Obradovic, Bush, Stamperdahl, Adler, & Boyce, 2010). For example, children may experience stress when forming new friendships or when exposed to academic challenges, parental conflict, or poor nutritional environments. Many of these daily stressors are especially pronounced in low-income settings (Ladd & Pettit, 2002; Magnuson & Duncan, 2002). When the body encounters a stressor, numerous physiological reactions take place to prepare the body for action through the autonomic nervous system (ANS). The ANS is comprised of two branches: the sympathetic nervous system, which initiates arousal (e.g., heart rate and sweat production increase) and the parasympathetic nervous system, which promotes recovery (Berntson, Cacioppo, & Quigley, 1993). Within minutes of ANS activation, glucocorticoid secretion activates the hypothalamic-pituitary-adrenocortical (HPA) axis, which is responsible for regulating glucose metabolism, blood pressure, and immunity (Sapolsky, Romero, & Munck, 2000).

Numerous methods for assessing autonomic and adrenocortical reactivity to stress are utilized in research with children. Autonomic reactivity is typically analyzed through skin conductance levels (SCL) and respiratory sinus arrhythmia (RSA). Skin conductance level is an electrodermal measure of stress elicited by sympathetic nervous system activity (El-Sheikh, 2007). Respiratory sinus arrhythmia is a measure of stress elicited by parasympathetic nervous system activity (Obradovic et al., 2010). Specifically, RSA assesses vagal tone by examining changes in heart rate (measured by electrocardiogram; Obradovic et al., 2010). Adrenocortical reactivity is commonly assessed through saliva samples analyzed for cortisol, which is a glucocorticoid hormone that is responsive to stress in the HPA axis (DeCaro & Worthman, 2008; Gunnar & Donzella, 2002; Kirschbaum & Hellhammer, 1994).

Interestingly, research indicates that how children react to daily stressors impacts their functioning across many domains. For example, high levels of SCL are linked to high emotional reactivity and negative affect in response to negatively arousing stimuli (Cole, Zahn-Waxler, Fox, Usher, & Wlesh, 1996). Furthermore, individuals displaying high levels of SCL reactivity are more likely to exhibit poor EF performance (Hendrawan, Yamakawa, Kimura, Murakami, & Ohira, 2012) as well as externalizing behavior problems (Cole et al., 1996), which are often implicated in EFs (Schoemaker, Mulder, Dekovic, & Matthys, 2013). Research using RSA shows similar findings, albeit in the opposite direction given that RSA is a measure of parasympathetic activity. Specifically, high RSA (basal and reactivity) is related to empathy and emotion regulation (Beauchaine, 2001; Eisenberg et al., 1995; Fabes, Eisenberg, & Eisenbud, 1993; Fox & Field, 1989; Obradovic et al., 2010) whereas low RSA (basal and reactivity) is related to emotional lability (i.e., poor emotion regulation; Beauchaine, 2001; Beauchaine, Gatzke-Kopp, & Mead, 2007; Field et al., 1996; Mezzacappa et al., 1997; Obradovic et al., 2010; Pine et al., 1996). Research examining the relationship between RSA reactivity and EF proxies (e.g., externalizing behaviors) is mixed with some studies demonstrating a relationship between low RSA reactivity and externalizing symptoms (e.g., Boyce et al., 2001; Obradovic et al., 2010) and other studies finding a relationship between high RSA reactivity and externalizing behavior problems (e.g., Crowell et al., 2005). Similarly, Hendrawan and colleagues (2012) found no association between heart rate reactivity and EF scores. Finally, high levels of cortisol have been linked to externalizing behaviors and poor academic competence (Obradovic et al., 2010).

Despite these associations, when considering the influence of physiological responses to stress on various developmental outcomes, it is important to consider the context that an individual is in (Ellis & Boyce, 2008; Obradovic et al., 2010). Originally, it was believed that highly reactive children in adverse environments were more vulnerable to maladaptive outcomes than their low-reactive counterparts (Belsky, Hsieh, & Crnic, 1998; Cummings, El-Sheikh, Kouros, & Keller, 2007; Deater-Deckard & Dodge, 1997; El-Sheik, 2005; Ramos, Guerin, Gottfried, Bathurst, & Oliver, 2005). Although this still holds true, recent evidence also suggests that these highly reactive individuals may show greater gains from adaptive environments (e.g., interventions) than their low-reactive peers (Blair, 2002; Klein Velderman, Bakermans-Kranenburg, Juffer, & van Ijzendoorn, 2006). Along the same lines, low reactivity may be advantageous in high-risk settings but maladaptive in supportive environments (Boyce, 2007; Boyce & Ellis, 2005; Ellis & Boyce, 2008; Obradovic et al., 2010). Thus stress reactivity is now typically conceptualized as a biological sensitivity to context such that children who have a heightened biological sensitivity (i.e., high physiological reactivity) experience maladaptive outcomes in negative contexts but adaptive outcomes in positive contexts (Boyce, 2007; Boyce & Ellis, 2005; Ellis & Boyce, 2008). In positive contexts, like various behavioral interventions (e.g., PATHS, Tools of the Mind; Bodrova & Leong, 2007; Domitrovich et al., 1999) we would expect to see a greater response to the intervention effects among highly reactive children than low-reactive children.

One positive context that appears to influence children's reactivity and EFs is supportive parenting (Ursache et al., 2013). In Ursache and colleagues' study, highly reactive children who did not have a high propensity of positive interactions with their parents during a free play task (e.g., low level of parental sensitivity, stimulation, positive regard) exhibited poor EFs. However, highly reactive children who did have positive interactions with their parents exhibited enhanced EFs. In other words, supportive parenting served as a protective factor for the development of cognitive skills of children who were highly reactive.

Along the same lines, in the present study I proposed that fantasy-oriented play may serve as an enhanced positive context under the biological sensitivity to context framework in which highly reactive, at-risk children will benefit. Similar to the effects I expect to see among low ER children, it was hypothesized that FO would moderate the relationship between physiological stress reactivity and EF such that better EF performance would be observed among children who were highly reactive but high in FO whereas EF performance would remain poor among children who were highly reactive and low in FO. Based on previous research (Ursache et al., 2013), I did not expect to see any significant changes in EF performance among children who were exhibiting mid to low physiological stress reactivity, regardless of their level FO. See

Figure 3.

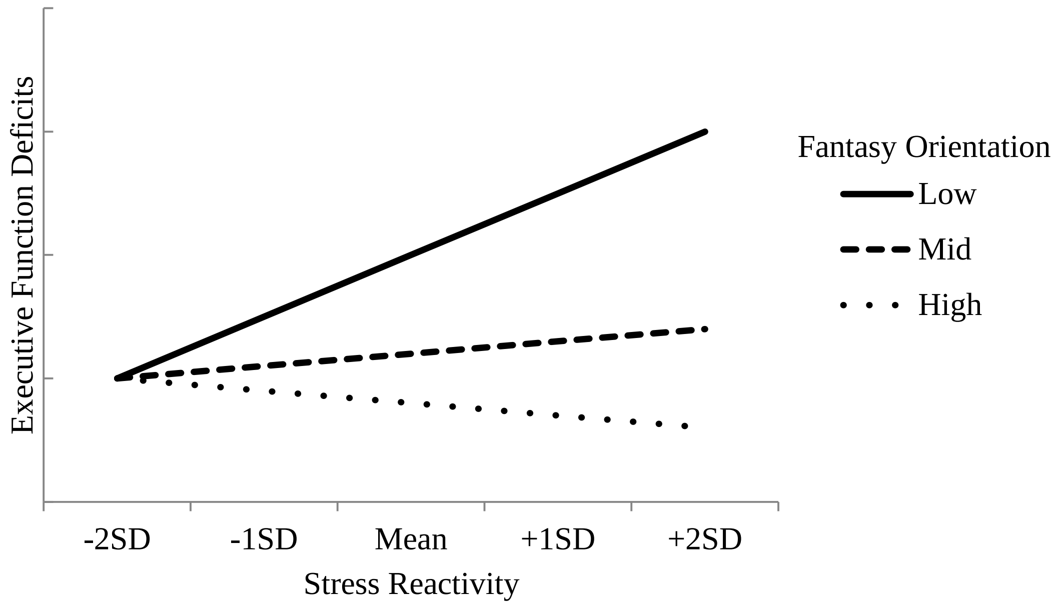

Figure 3. Hypothesized interaction between FO and Stress Reactivity on EF.

METHODOLOGY

Participants

The present study included 343 preschoolers between four and five years of age (M_{age} = 4.08 years, SD = .28) who were enrolled in a larger federally funded, longitudinal, socio-emotional intervention study for at-risk families. All participants were recruited from 14 Head Start preschools across West Alabama. The sample was 45% female, 55% male, and predominantly African American (82%) from low-income families (M_{income} = \$15,000-\$20,000). Demographics can be found in Table 1.

Table 1

Demographic Statistics.

Construct	**Percent/Mean**
Gender	
Boys	55%
Girls	45%
Age (in years)	4.08
Race	
Caucasian	8%
African American	82%
Other	10%
Family Income	M = $15,000-$20,000
Parent Education	M = partial college (at least 1 year or technical training)

Measures

The present study incorporated measures of ER, stress reactivity, and EF that were collected as part of the larger intervention study mentioned above. Teacher and child measures of FO were added to the existing battery for the purposes of the present study. Each measure is described below.

Emotion Regulation Measures. Emotion regulation was assessed using two teacher questionnaires. The first scale was the 24-item Emotion Regulation Checklist (Shields & Cicchetti, 1995; Shields & Cicchetti, 1997), which is comprised of two subscales: Emotion Regulation (α = .76) and Lability/Negativity (α = .89). The Emotion Regulation subscale contains 8 questions that assess empathy, emotional self-awareness, and appropriate displays of emotion. For example, teachers were asked to report if a particular child "is a cheerful child" and "can say when s/he is feeling sad, angry or mad, afraid or fearful." Teachers responded on a 4-point Likert scale with 1 being "Never" and 4 being "Almost Always." On this subscale, all scores were averaged with higher scores indicating better ER. The Lability/Negativity subscale consists of 14 questions that measure mood lability, flexibility, and poorly regulated negative affect. Sample items include "is easily frustrated" and "is prone to disruptive outbursts of energy and exuberance." These questions were also rated on the same 4-point Likert scale and averaged to create an overall subscale score, but higher scores on this subscale indicated more negativity and poorer ER.

In order to minimize any overlap between this measure of ER and EF constructs, two items that tap EF were removed from the Emotion Regulation Checklist. Specifically, item 9, "is able to delay gratification," and item 20, "is impulsive," were removed prior to any analyses. Both of these items were from the Lability/Negativity subscale. Reliability analyses indicated that after removing these two items, this subscale remained highly reliable (α = .87). In addition, a confirmatory factor analysis (CFA) was performed to assess the factor structure of the Lability/Negativity subscale after removing items 9 and 20. As expected, all remaining items loaded onto one factor, with factor loadings ranging from .43-.79. The χ^2 goodness-of-fit index for the overall model was significant, $\chi^2(65) = 207.28$, $p < .00$, suggesting a lack of fit between the hypothesized model and the data. However, due to the sensitivity of χ^2 in large samples, it has been suggested to divide the χ^2 value by the degrees of freedom, with values less than 3 indicating a good fit (Gable & Wolf, 1993). In doing so, a value of 3.19 was obtained. When compared to the fit of the original subscale without the deletion of items 9 and 20, $\chi^2(90) = 328.09$, $p < .00$ ($\chi^2/df = 3.65$), the new subscale with the items removed improved the model fit significantly, $\Delta\chi^2(25) = 120.82$, $p < .01$. Therefore, it was determined that the factor structure among the remaining items on the Lability/Negativity subscale after deleting items 9 and 20 remained intact.

In addition to the ERC, ER was assessed using the Emotional Control subscale of the Behavior Rating Inventory of Executive Function – Preschool ($\alpha = .92$; BRIEF-P; Gioia, Isquith, Retzlaff, & Espy, 2002). This measure contains a total of 63 questions (10 questions on Emotional Control Subscale) to gauge various clinical EF scales (i.e., Inhibit, Shift, Emotional Control, Working Memory, Plan/Organize). Teachers were asked to report how often (i.e., never, sometimes, or often) certain behaviors have been a problem for a child during the last six months (e.g., overreacts to small problems, becomes upset with new situations). The Emotion Control subscale of the BRIEF-P was coded using standard procedures outlined in the BRIEF-P manual (Gioia et al., 2002). However, a T-score was not calculated for the Emotion Control subscale due to the item changes made. Higher scores on the Emotional Control subscale of this measure indicate poorer ER. This measure is highly reliable ($\alpha = .80$-$.98$) and is consistent across different administrations (retest = .82-.88).

Executive Function Measures. Four previously established measures were used to directly assess various aspects of EF (e.g., working memory, inhibitory control, attention shift).

Working Memory. In order to assess working memory, the forward digit span task was used (Davis & Pratt, 1996). During this task, an experimenter instructed a child to repeat the numbers they say. After two examples, the child was asked to repeat strings of digits after the experimenter had stated them. A child's total score on this task was equal to the highest number of digits that he or she successfully repeated. The forward digit span is an appropriate measure of working memory for young children and has been shown to be reliable across different testing sessions ($r = .78$; Henry, 2001). In addition, this task is correlated with other measures of working memory (i.e., backward digit span, word span, pattern span, spatial span, listening span), thus providing evidence for the construct validity of this measure (Henry, 2001).

Inhibitory Control.

Cognitive Inhibitory Control. The Grass/Snow task was used as a measure of cognitive inhibitory control (Carlson & Moses, 2001). In this Stroop-like task, participants were presented with two pictures: a picture of a grassy field (i.e., "grass") and a picture of a snowy field (i.e., "snow"). Participants were instructed to point to the grassy field when the experimenter said "snow", and to point to the snowy field when the experimenter said "grass". Before completing 16 test trials, each child underwent two practice trials during which time each target word was said once. If a child pointed incorrectly during either of these practice trials, the experimenter repeated both rules and the practice trials as necessary. Number of correct, incorrect, and self-corrected (i.e., initially incorrect but self-corrected to appropriate answer) responses were recorded. Correct answers were given a score of 1, self-correct answers were given a score of .5, and incorrect answers were given a score of 0, resulting in a maximum possible score of 16. Higher scores on this measure indicated better inhibitory control. In addition to being correlated with other established measures of inhibitory control (Carlson & Moses, 2001), this measure has alpha values ranging from .56-.93 (Carlson & Moses, 2001; Gerstadt et al., 1994; Wright et al., 2003).

Behavioral Inhibitory Control. Behavioral inhibition was assessed using the Gift Task (Kochanska et al., 1996). During this task, participants had to inhibit an automatic response to peek as the experimenter prepared a "big surprise" for the child. Specifically, the child was seated in a chair facing away from the experimenter and was told not to look as the experimenter noisily wrapped a gift for 60 seconds. The experimenter informed the child that they would tell them when they were finished wrapping the gift and when the child could turn around and look. During this time, the experimenter recorded the amount of peeks made by the child. This task has been used as a measure of behavioral inhibition among toddlers and preschool aged children and has an inter-rater reliability of .88 (Kochanska et al., 1996). This task also exhibits convergent validity with maternal reports of child inhibitory control (Kochanska et al., 1996). Although this task could involve ER components, the primary goal of this task is to examine how well a child is able to inhibit the prepotent response to turn around, not how well the child is controlling their emotions (e.g., showing outward signs of frustration that they have to wait). Thus, this task was conceptualized as an EF task, not an ER task.

Attention Shift. Finally, participants' ability to shift their attention was assessed using the Standard Dimensional Change Card Sort task (Zelazo, 2006; Zelazo, Muller, Frye, & Marcovitch, 2003). Children were presented with two small boxes labeled with two different target images (e.g., a blue square and a red star). The experimenter told the child that they were going to play two games: the "shape game" and the "color game." They began by explaining the shape game. The child was told to place all the star cards (both blue and red) in the container labeled with the red star, and all square cards (both blue and red) in the container labeled with the blue square. After the child correctly sorted five cards consecutively (or they ran out of cards), the experimenter told the child to stop playing the shape game and start playing the color game. The experimenter explained to the child that they should now place all blue cards (stars and squares) in the container labeled with a blue square, and all of the red cards (stars and squares) in the container labeled with a red star. The task ended when the child correctly sorted five cards consecutively, or they ran out of cards (25 total trials). The order of the color/shape game was randomized. This task was scored as the number of inaccurate card sorts after the rule switch. This particular task was chosen because it is developmentally appropriate for children and is reliable and valid (Zelazo, 2006; Zelazo et al., 2003).

Teacher Measures of EF. To obtain a comprehensive picture of a child's EF, I also assessed teacher reports of students' EF behaviors at school using the Inhibit (α = .93), Shift (α = .86), Working Memory (α = .95), and Plan/Organize (α = .90) subscales of the BRIEF-P (Gioia et al., 2002). The Emotional Control subscale was not used as an index of EF. Teachers were asked to report how often (i.e., never, sometimes, or often) certain behaviors have been a problem for a child during the last six months (e.g., when given things to do, remembers only the first or last). In order to minimize any overlap between ER and EF constructs, three out of 16 items that tap ER were removed from the Inhibit subscale (e.g., becomes too silly), and three out of 10 items that tap ER were removed from the Shift subscale (e.g., becomes upset with new situations).

After removing the three items from the Inhibit subscale, reliability analyses indicated that this subscale remained highly reliable (α = .91). In addition, a confirmatory factor analysis (CFA) was performed to assess the factor structure of the Inhibit subscale after removing items 8, 18, and 60. As expected, all remaining items loaded onto one factor, with factor loadings ranging from .24-.86. The χ^2 goodness-of-fit index for the overall model was significant, $\chi^2(65) = 301.45$, $p < .00$, suggesting a lack of fit between the hypothesized model and the data. When dividing χ^2 by the degrees of freedom, a value of 4.64 was obtained, still indicating a poor fit. However, when compared to the fit of the original subscale without the deletion of items 8, 18, and 60, $\chi^2(104) = 415.588$, $p < .00$ (χ^2/df = 4.00), the new subscale with the items removed improved the model fit significantly, $\Delta\chi^2(39) = 114.14$, $p < .01$. Therefore, it was determined that the factor structure among the remaining items on the Inhibit subscale after deleting items 8, 18, and 60 remained intact.

With regards to the Shift subscale, after removing items 5, 15, and 50 from this subscale, reliability analyses indicated that this subscale remained adequately reliable ($\alpha = .78$). In addition, a confirmatory factor analysis (CFA) was performed to assess the factor structure of the Shift subscale after removing items 5, 15, and 50. As expected, all remaining items loaded onto one factor, with factor loadings ranging from .34-.72. The χ^2 goodness-of-fit index for the overall model was significant, $\chi^2(14) = 92.10$, $p < .00$, suggesting a lack of fit between the hypothesized model and the data. When dividing χ^2 by the degrees of freedom, a value of 6.58 was obtained, still indicating a poor fit. However, when compared to the fit of the original subscale without the deletion of items 5, 15, and 50, $\chi^2(35) = 180.75$, $p < .00$ (χ^2/df = 5.16), the new subscale with the items removed improved the model fit significantly, $\Delta\chi^2(21) = 88.65$, $p < .01$. Therefore, it was determined that the factor structure among the remaining items on the Shift subscale after deleting items 5, 15, and 50 remained intact.

The BRIEF-P was coded using standard procedures outlined in the BRIEF-P manual (Gioia et al., 2002). However, T-scores were not calculated due to the item changes made among the Inhibit and Shift subscales. Higher scores on this measure indicate poorer executive control.

This measure of EF is highly reliable (α = .80-.98) and is consistent across different administrations (retest = .82-.88).

Fantasy Orientation Measures.

Child Fantasy Orientation Measures. Two established child questionnaires were used to assess participants' level of FO: Singer and Singer's (1981) Imaginative Play Predisposition Interview and Taylor and Carlson's (1997) Imaginary Companion and Impersonation Interview. In the Singer and Singer's (1981) Imaginative Play Predisposition Interview, children were asked questions about their favorite game, favorite toy, favorite story, and favorite television show. In addition, participants were asked what they like to do when they are alone and with other kids, as well as what they think about before going to sleep. These questions were independently coded by two trained raters. Responses indicating interest in fantastical toys, stories, and/or games (e.g., fairies or superheroes) were given a score of 2. Responses involving anthropomorphized/animated toys, stories, and/or games (e.g., stuffed animals, toy cars) were given a score of 1, and responses involving realistic toys, stories, and/or games (e.g., checkers, bingo) were given a score of 0. Responses that were unintelligible were not scored. See Appendix A.

The second measure that was used to assess participants' FO was Taylor and Carlson's (1997) imaginary companion and impersonation interview. This measure is divided into two separate scales. The first scale includes a maximum of 10 questions, beginning with whether or not a child has an imaginary companion. If the child responded "yes," they were asked to provide further details including their imaginary companion's name, if their imaginary companion is a toy or completely pretend, the gender and age of their companion, what they like and dislike about their companion, where their companion lives, and where their companion sleeps. The follow-up questions were used to confirm that the child actually had an imaginary companion and that they did not answer the first question based on a real friend. On this scale, a score of 1 indicated a child reporting an imaginary companion(s) and a score of 0 indicated a child saying they did not have one. The second scale of the imaginary companion and impersonation interview assessed participants' likelihood of engaging in pretend-play and impersonating behaviors. Specifically, each child was asked if they ever pretend to be an animal, a different person, or anything unrelated to their self (e.g., an airplane). Answers to each of these questions were followed-up with questions probing for more details, such as what the child specifically pretends to be. Participants received a score of 1 for each question to which they answered "yes". Scores ranged from 0-3 points per participant, with higher scores indicating higher levels of FO. See Appendix B.

Both measures of FO were chosen based on their use in past research (Pierucci et al., 2014; Sharon & Woolley, 2004; Taylor & Carlson, 1997; Taylor, Cartwright, & Carlson, 1993; Thibodeau et al., 2016; Woolley, Boerger, & Markman, 2004). Inter-rater reliabilities for all FO measures range from 73% to 93% (Sharon & Wooley, 2004; Taylor & Carlson, 1997). In addition, scores on each measure appear to remain consistent across different testing sessions and correlate highly with one another (Sharon & Wooley, 2004).

Teacher Fantasy Orientation Measures. Teachers also completed the Fantasy Orientation Questionnaire (Gilpin, 2009) and the Teacher Imagination Questionnaire (Gilpin, Thibodeau, & Brown, *in preparation*). On the Fantasy Orientation Questionnaire, the first 7 questions asked teachers to report whether or not the child believes in a list of seven fantastical figures (e.g., Santa Claus, ghosts). Answers to this question received a score of 1 if the teacher indicated that the child believes the entity is real, .5 if they think the child is unsure of the entity's existence, and 0 if the child believes the entity is pretend. Next, teachers were asked to list the child's favorite books, games, TV shows, and videogames. Responses to this item were coded from a standardized list of responses used to score similar questions in previous research (Boerger, Tullos, & Woolley, 2009; Gilpin, 2009; Woolley et al., 2004). Answers that were more reality based received a score of 0 (e.g., hide-and-seek or Madeline), those that were representational or anthropomorphic but not fantastical received a score of 1 (e.g., Cars or Curious George), and those that were high fantasy based received a score of 2 (e.g., superheroes or Mary Poppins). Finally, teachers were asked to rate a child's level of FO using a 5-point scale, with 1 indicating a strong interest in reality (e.g., plays sports), 2 indicating some interest in fantasy but mostly interested in reality, 3 indicating equal interests in fantasy and reality play/media, 4 indicating mostly interested in fantasy but some interest in reality, and 5 indicating a strong interest in fantasy (e.g., often engages in pretense, enjoys fantastical books). This measure of FO was chosen based on its use in past research (Brown et al., *in press*; Gilpin, Brown, & Pierucci, 2015; Pierucci et al., 2014; Thibodeau et al., 2016). Inter-rater reliabilities range from 75% to 80% (Thibodeau et al., 2016). See Appendix C.

On the Teacher Imagination Questionnaire ($\alpha = .92$), the teachers answered 22 questions on a Likert scale from 1 (never) to 5 (almost every day) regarding a child's propensity towards and experience with fantastical imagination (e.g., "Do you ever observe this child interacting with an imaginary friend?", "Does this child ever impersonate another character from a book, TV show, etc.?"). See Appendix D.

Physiological Reactivity Measures. Physiological responses to mild social, cognitive, and emotional challenges were assessed using a standard and validated reactivity protocol that was developed for preschool children and has been used in low-income populations (Alkon et al., 2003; Obradovic et al., 2010). For the current study, only sympathetic nervous system reactivity through SCL was included in analyses. This particular measure was chosen based on its relationships with both ER and EF proxies (Cole et al., 1996) as well as its perceived stability overtime (El-Sheikh, 2007). El-Sheikh (2007) notes that both SCL baseline and reactivity data remained stable over a period of 2 years in a sample of children. By contrast, there is mixed evidence regarding the stability of RSA reactivity in children (Alkon, Boyce, Davis, & Eskenazi, 2011; Bornstein & Suess, 2000; Calkins & Keane, 2004; Doussard-Roosevelt, Montgomery, & Porges, 2003) as well as how this particular measure relates to EF proxies (Boyce et al., 2001; Crowell et al., 2005; Obradovic et al., 2010).

Children’s SCL was examined using NeuLog galvanic skin response sensors and a pair of electrodes filled with isotonic gel. The electrodes were placed on the palm (i.e., one below the thumb, one below the little finger) of the child’s non-dominant hand. The sensors used a high internal impedance differential operational amplifier to convert small changes in skin resistance/conductivity into measurable voltage, which was sampled at a rate of 100 Hz. In addition, to ensure that SCL readings were within a readable range, a 100 KΩ resistor was added in-line as a signal attenuator.

Once the SCL equipment was attached, the child underwent the following series of tasks: baseline story, social interview (control), social interview (challenge), number repetition (control), number recall (challenge), water taste test (control), lemon juice taste test (challenge), emotion video – neutral (control), emotion video - mild anxiety-provoking Disney clip (challenge), baseline story. During the first baseline story, an interviewer read, “If You Give a Moose a Muffin” to the child in a calm, even tone. If a child was not engaged in the story, the interviewer made attempts to refocus the child by pointing to the pictures or asking the child to look at the book. The social interview consisted of two parts: social interview control and social interview challenge. During the control portion of the social interview, children were shown a wordless picture book for two minutes and asked to describe what they saw on the pages (e.g., colors, objects). During the challenge portion of the social interview, children were asked to respond to a series of questions for two minutes (e.g., “How old are you?”, “When is your birthday?”, “Do you have a lot of friends?”). Interviewers used a neutral tone of voice and did not comment on children’s answers. Next, children completed a number recall as a cognitive challenge. Before they engaged in the recall task, each child completed a number repetition warm-up (i.e., control) task. During this task, the interviewer stated one number at a time and had the child repeat each number. The interviewer did not point out any errors. Once the number repetition task was finished, children completed the number recall task where they were asked to repeat strings of digits after the interviewer. The number of digits in each string got progressively longer throughout the task. This task lasted for a total of two minutes. Next, children completed a taste identification task, starting with a control portion where water was applied to the tip of a child’s tongue using a dropper. The child was then asked a series of questions for a total of one minute (e.g., “What does it taste like?”, “Is it sweet or sour?”). Following the water identification task, children went through a more challenging lemon juice taste identification task. Similar to before, lemon juice was applied to the child’s tongue using a dropper and the child was asked the same questions asked during the water identification task for a total of one minute. Finally, children were shown two videos. The first video was a neutral video (i.e., calming kaleidoscope) that lasted for two minutes. The second video was an emotion-evoking clip about a scary witch (i.e., clip from Sleeping Beauty). The second video lasted for two minutes and was followed by a debriefing. Children watched the videos on a tablet held by the interviewer and listened to the videos through headphones. Finally, the challenge protocol ended with a baseline story about squirrels.

Data from these challenge and control tasks were first cleaned by visual inspection. The data for each task were examined in 30-second blocks. By default, the 2nd 30-second block was chosen for analyses. However, if the SCL signal in this block of data was too noisy, an alternate block was chosen. If noise was present in the chosen 30-second block, the sampling time frame was adjusted so that this noise was not included in the calculation of tonic SCL for that particular task. Tonic SCL values were not calculated for tasks that had fewer than 15 consecutive seconds of clean data.

Reactivity during each control task was used to control for baseline levels of arousal. Specifically, four standardized residual scores were created by regressing tonic SCL arousal values during challenge tasks on their respective control task values (Obradovic et al., 2010). In doing so, I obtained a score representing how much each child's arousal during the challenge task deviated from the regression line calculated from all children's responses in my sample (Manuck, Kasprowicz, & Muldoon, 1990). These standardized residual scores were then averaged to create an overall SCL Reactivity index. Reactivity scores were not calculated for children who were missing more than two of the four control-challenge task pairs. Positive reactivity values indicate an increase in SCL (i.e., increased sympathetic nervous system activity), whereas negative reactivity values indicate a decrease in SCL (i.e., decreased sympathetic nervous system activity) in repose to a given challenge.

Control Measure. Because previous research demonstrates that vocabulary is strongly related to EF performance in preschool children (Carlson & Moses, 2001), vocabulary level was assessed to control for individual differences. The Peabody Picture Vocabulary Test, Fourth

Edition Form B (PPVT-4; Dunn & Dunn, 2007) was administered to each participant. Children were shown a colored book that contained several pages with four pictures on each page. The experimenter said a word that related to one of the pictures on the page and asked the child to point to the picture that best matched the word. After the child passed the training items, the experimenter progressed through the pages of the book, with each item getting progressively more challenging. The PPVT-4 consists of 19 sets with 12 items in each set for a total of 228 items. Participants were tested until they incorrectly identify eight vocabulary words within one set of 12 items, at which time the test ended.

The PPVT-4 was coded using standard procedures outlined in the Form B manual. The PPVT-4 exhibits excellent internal consistency and test-retest reliability (α > .90; Dunn & Dunn, 2007). In addition, this task correlates with several other language measures giving evidence for the construct validity of the PPVT-4 (Dunn & Dunn, 2007).

Procedure

After obtaining consent for participation from parents and assent for participation from children, all participants were individually interviewed by research assistants during two separate 60-minute sessions. Emotion Regulation, EF, and physiological data were collected at the beginning of the school year and FO data at the end of the school year. The FO measures used in the present study are thought to be reasonably stable overtime (Fehr, 2017; Pierucci et al., 2014; Thibodeau et al., 2016). Therefore I do not anticipate that FO scores at the beginning of the year would be different from FO scores at the end of the year when these data were collected. Interviews occurred in a quiet room at the child's preschool. After completing the interviews, children received a small prize (e.g., sticker) for participating. Teachers also completed ER and EF questionnaires at the beginning of the school year and FO questionnaires at the end of the school year. Teachers were given $10 per child that they provided information for. Although the measures of the present study were assessed at two separate time points (i.e., ER, EF, and physiological data at the beginning of the school year, FO data at the end of the school year), the data were not considered longitudinal but rather were analyzed together as one time point. All teachers and interviewers were blind to the purpose and the hypotheses of the present study.

RESULTS

Preliminary Analyses

Prior to any analyses, data were cleaned using a double-entry procedure. Missing data imputation methods (i.e., mean imputation) were used to estimate missing data when no more than 10% of the data on one measure were missing (Schafer & Graham, 2002). See Appendix H for distributions of each variable of interest. Although some outliers were present in the data, these outliers, which were few in number, were left in the data because variance in children's performance is of particular interest to the present study.

FO Components. Because FO is considered a form latent variable, FO items were first categorized into distinct components using a principal component analysis (PCA) with varimax rotation, as has been done in previous research to form FO constructs (Brown et al., *in press*; Pierucci et al., 2014; Thibodeau et al., 2016). Descriptive statistics for and correlations among all individual FO items can be found in Tables 2-6. Based on previous literature, I expected that these data would load onto four FO constructs (i.e., FO cognitions, FO toys and games, FO entities, and FO pretense; Pierucci et al., 2014).

Initially items from all FO measures were included in one PCA. However, it was clear that items from the Teacher Imagination Questionnaire were uniquely loading onto one factor and over-complicating the factor analysis. Because of this and the fact the Teacher Imagination Questionnaire (Gilpin et al., *in preparation*) is still in the development stage, I conducted a separate PCA for established FO measures (i.e., ones used to create FO components in previous literature) and the Teacher Imagination Questionnaire.

Table 2

Descriptive Statistics – Established Fantasy Orientation Measures.

Item	**N**	**Possible Range**	**Actual Range**	**Mean**	**SD**
Imaginary Companion and Impersonation Interview					
Imaginary Companion	222	0-1	0-1	.59	.50
Pretend to be Animal	220	0-1	0-1	.70	.46
Pretend to be Different Person	220	0-1	0-1	.67	.47
Pretend to be Anything Else	220	0-1	0-1	.65	.48
Imaginative Play Predisposition Interview					
Favorite Game	203	0-2	0-2	.89	.78
Favorite Toy	209	0-2	0-2	1.25	.63
Favorite Story	204	0-2	0-2	1.25	.64
Favorite TV Show	199	0-2	0-2	1.45	.66
Play by Self	208	0-2	0-2	.66	.65
Play with Others	211	0-2	0-2	.64	.69
Think Before Sleep	210	0-2	0-2	.91	.76
Talk to Self	216	0-1	0-1	.68	.47
Fantasy Orientation Questionnaire					
Belief in Santa Claus	290	0-1	0-1	.86	.31
Belief in Easter Bunny	292	0-1	0-1	.72	.33
Belief in Tooth Fairy	292	0-1	0-1	.80	.30
Belief in Fairies	292	0-1	0-1	.58	.30
Belief in Witches	292	0-1	0-1	.49	.27
Belief in Ghosts	292	0-1	0-1	.53	.30
Belief in Dragons	292	0-1	0-1	.47	.32
Favorite TV Shows/Books	232	0-2	0-2	1.59	.55
Favorite Games	247	0-2	0-2	.89	.55

Note. Established FO measures and items can be found in Appendix A-C.

Table 3

Descriptive Statistics – New Teacher Imagination Questionnaire.

Item	**N**	**Possible Range**	**Actual Range**	**Mean**	**SD**
		Teacher Imagination Questionnaire			
1	289	1-5	1-5	1.53	.92
2	287	1-5	1-5	2.61	1.06
3	287	1-5	1-5	2.36	1.02
4	286	1-5	1-5	2.00	1.03
5	288	1-5	1-5	2.74	1.15
6	286	1-5	1-5	2.58	.90
7	287	1-5	1-5	3.49	.99
8	288	1-5	1-5	3.27	1.04
9	286	1-5	1-5	1.78	1.02
10	288	1-5	1-5	3.43	1.01
11	288	1-5	1-5	2.93	1.11
12	288	1-5	1-5	3.18	1.14
13	287	1-5	1-5	3.32	.98
14	286	1-5	1-5	2.73	1.03
15	287	1-5	1-5	2.07	1.03
16	287	1-5	1-5	2.43	1.05
17	286	1-5	1-5	3.16	1.10
18	288	1-5	1-5	1.99	.90
19	285	1-5	1-5	2.92	1.01
20	286	1-5	1-5	2.90	1.11
21	286	1-5	1-5	3.09	1.08
22	285	1-5	1-5	3.96	1.05

Note. Teacher Imagination Questionnaire items can be found in Appendix D.

Table 4

Correlations among Items from Established FO Measures.

Item	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.
1. IC	1																				
2. IMP1	.12	1																			
3. IMP2	.18	.31	1																		
4. IMP3	.11	.28	.41	1																	
5. IPP1	-.02	.02	.12	-.03	1																
6. IPP2	.02	-.04	-.04	.04	.19	1															
7. IPP3	-.05	-.09	.06	-.05	.11	.25	1														
8. IPP4	-.02	-.09	-.04	.01	.13	.25	.21	1													
9. IPP5	.12	-.10	.04	-.01	.19	.11	.13	.16	1												
10. IPP6	-.02	-.04	-.01	.02	.10	.09	.06	.06	.24	1											
11. IPP7	-.08	-.05	.00	.01	.02	.04	.13	.07	.08	.08	1										
12. IPP8	.20	,14	.09	.12	.04	-.05	.01	-.01	.10	.00	.01	1									
13. Bel. 1	-.01	.06	.07	.09	-.10	.20	.03	-.02	.00	.05	-.04	.06	1								
14. Bel. 2	-.07	-.01	.15	.13	-.06	.18	-.05	-.05	-.04	.08	-.10	.07	.61	1							
15. Bel. 3	.01	-.02	.16	.06	-.05	.12	-.02	-.12	.06	-.02	-.10	.12	.56	.66	1						
16. Bel. 4	.06	-.13	.00	.10	.08	.10	.00	-.02	-.06	-.07	-.16	.03	.30	.42	.41	1					
17. Bel. 5	.06	-.08	.03	.11	.12	.17	.04	-.04	-.01	-.02	-.17	.06	.20	.29	.26	.56	1				
18. Bel. 6	.04	-.06	.02	.03	.00	.21	.05	-.04	.02	-.01	-.23	.01	.26	.40	.40	.47	.64	1			
19. Bel. 7	.01	.02	.06	.13	.14	.19	.02	-.05	-.02	.07	-.13	.00	.20	.28	.25	.39	.62	.58	1		
20. Media	.02	.06	-.01	.07	-.07	.04	-.04	.12	.04	.18	-.10	.03	.07	.04	.06	-.10	-.06	-.12	-.16	1	
21. Play	-.04	-.11	-.14	-.06	-.19	.06	-.04	.15	.04	-.05	-.05	.05	-.07	-.10	-.04	-.19	.02	.02	-.04	.06	1
22. FO	-.02	-.04	-.21	-.13	.09	.07	.05	.10	.23	.12	-.04	.08	.01	.07	.02	.09	.14	.16	.11	-.02	.12

Note. Established FO measures and items can be found in Appendix A-C. Light gray shading: $p \leq .05$; Dark gray shading: $p \leq .01$.

Table 5

Correlations among Items from New Teacher Imagination Questionnaire.

TIQ Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	1																				
2	.23	1																			
3	.37	.60	1																		
4	.51	.31	.44	1																	
5	.10	.57	.50	.27	1																
6	.11	.30	.37	.26	.45	1															
7	.01	.46	.33	.18	.59	.34	1														
8	.06	.40	.33	.21	.55	.44	.69	1													
9	.42	.23	.34	.43	.16	.17	.06	.13	1												
10	-.02	.45	.27	.08	.63	.35	.71	.62	.06	1											
11	.19	.41	.41	.30	.48	.46	.50	.54	.29	.57	1										
12	-.01	.52	.35	.14	.67	.33	.68	.56	.11	.70	.53	1									
13	.02	.37	.24	.08	.50	.33	.48	.43	.05	.55	.38	.53	1								
14	.27	.36	.43	.42	.36	.44	.28	.40	.26	.33	.53	.25	.33	1							
15	.54	.26	.41	.62	.16	.16	.12	.22	.39	.08	.32	.11	.11	.45	1						
16	.37	.30	.40	.48	.27	.33	.19	.30	.28	.21	.40	.14	.18	.66	.62	1					
17	.05	.38	.32	.15	.49	.28	.44	.42	.08	.39	.31	.47	.46	.21	.08	.15	1				
18	.31	.32	.40	.35	.29	.32	.20	.33	.24	.15	.30	.20	.25	.42	.36	.40	.32	1			
19	.15	.46	.44	.28	.56	.57	.47	.52	.14	.42	.46	.48	.39	.44	.20	.38	.50	.36	1		
20	.10	.37	.30	.28	.44	.30	.44	.48	.16	.39	.43	.42	.27	.31	.28	.34	.35	.24	.53	1	
21	.04	.33	.23	.21	.47	.30	.59	.64	.11	.54	.47	.54	.36	.28	.18	.23	.44	.30	.53	.68	1
22	.03	.18	.15	.09	.30	.23	.46	.50	.02	.34	.31	.32	.29	.14	.08	.14	.43	.21	.46	.46	.57

Note. Teacher Imagination Questionnaire items can be found in Appendix D. Light gray shading: $p \leq .05$; Dark gray shading: $p \leq .01$.

Table 6

Correlations among Established FO Measure Items and New Teacher Imagination Questionnaire Items.

TIQ Items ➔	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
IC	-.02	-.04	.04	.06	-.10	-.06	-.05	-.06	.00	-.06	-.06	-.06	-.02	-.06	.00	.06	-.08	.05	-.08	.05	.03	-.06
IMP1	-.08	-.10	-.13	-.01	-.09	.08	-.07	-.13	.06	-.04	-.05	-.07	.07	-.10	-.15	-.18	.04	-.11	-.02	-.10	-.06	.08
IMP2	-.14	-.11	-.10	-.07	-.10	.07	-.18	-.08	-.06	-.06	-.10	-.20	-.11	-.01	-.08	-.05	-.04	-.12	-.12	-.13	-.10	-.03
IMP3	-.06	-.12	-.07	-.09	-.09	.08	-.11	.02	.09	.00	.08	-.08	.08	-.03	-.01	.03	-.01	-.05	-.06	-.01	.12	.08
IPP1	-.04	-.06	-.05	-.04	-.08	-.12	-.08	-.03	.18	-.13	-.12	-.08	-.18	-.07	-.09	-.03	.02	-.09	-.11	-.04	-.12	-.04
IPP2	.02	.00	-.01	.07	.06	.03	.00	.06	.08	.01	.02	-.01	.02	.07	-.11	.02	.09	.10	.09	-.01	.02	.01
IPP3	.14	.13	.14	.06	.05	.01	-.02	-.03	.02	-.09	.00	.01	-.03	.16	.04	.14	-.02	.13	.07	-.01	-.08	-.07
IPP4	-.02	.03	-.08	.08	.04	-.05	.07	.03	-.05	.02	.00	.02	-.12	.08	-.06	.01	.03	.09	-.03	.04	.07	.00
IPP5	.04	.05	.02	.09	.05	-.01	-.01	-.04	.04	-.04	-.01	.05	-.10	-.07	-.05	.03	.07	.04	-.03	-.03	.08	.01
IPP6	.01	-.01	-.02	-.03	.07	-.03	-.04	-.04	.03	-.08	-.10	-.04	.00	-.03	.02	.00	-.04	.02	-.07	-.03	.03	-.07
IPP7	-.04	.00	.00	-.17	.08	-.04	.09	.05	-.19	.13	-.06	.08	.11	-.05	-.03	.06	.02	-.06	-.02	.01	.03	.08
IPP8	-.06	-.02	-.08	.08	.02	.17	.03	.06	.08	.02	.16	.12	.05	.05	.11	.11	-.06	.06	.05	.15	.06	.09
Bel. 1	-.19	-.08	-.06	-.07	.07	.25	.05	.09	-.04	.13	.06	.08	.07	.07	-.08	-.04	.09	-.03	.10	.07	.10	-.05
Bel. 2	-.04	-.08	-.05	-.03	-.03	.25	.01	.07	.04	.04	.07	-.01	-.10	.08	.01	.08	.04	-.06	.09	.07	.02	-.09
Bel. 3	-.12	-.07	-.03	-.04	-.01	.24	.01	.08	.06	.05	.09	-.03	-.09	.08	.00	.06	.00	.01	.09	.10	.02	.02
Bel. 4	.-04	-.17	.00	.06	.15	.10	-.10	-.01	.10	-.12	.04	-.13	-.23	.00	-.03	.02	-.07	.01	.00	.05	.02	-.06
Bel. 5	.04	-.10	.05	.01	-.07	.01	-.05	.08	.17	-.06	.10	.03	-.08	-.02	.04	-.03	.03	-.02	.06	.07	.04	-.04
Bel. 6	.03	-.05	.00	-.03	-.04	.04	-.06	.03	.10	-.07	.02	-.03	-.13	.06	-.04	-.01	.03	.03	.04	.05	.01	-.02
Bel. 7	.00	-.27	-.13	-.14	-.19	-.12	-.17	-.08	.07	-.12	-.05	-.10	-.21	-.12	-.06	-.14	-.15	-.17	-.10	-.07	-.05	-.11
Media	-.02	-.01	.06	.07	.03	.09	-.10	-.18	.08	-.04	-.05	-.02	-.05	-.01	-.09	.06	-.01	.11	-.08	-.21	-.20	-.19
Play	-.05	.16	.03	.02	.20	.05	.20	.29	.05	.28	.21	.32	.21	.13	.05	.12	.15	.12	.11	.19	.28	.17
FO	.14	.20	.26	.20	.20	.08	.16	.14	.17	.10	.20	.27	-.02	.19	.10	.14	.04	.06	.16	.10	.13	.00

Note. All FO measures and items can be found in Appendix A-D. Light gray shading: $p \leq .05$; Dark gray shading: $p \leq .01$.

For the PCA of the established FO measures, the scree plot identified 3 constructs that were more or less consistent with the constructs identified in previous literature. The first construct ("FO Entities") included teacher reports of children's beliefs in seven fantastical entities (e.g., Santa Claus, the Tooth Fairy) from Gilpin's (2009) Fantasy Orientation Questionnaire (Eigenvalue = 3.495, factor loadings: .44-.75). Unlike previous literature (Pierucci et al., 2014), the first question from Taylor and Carlson's (1997) Imaginary Companion and Impersonation Interview that assessed whether or not a child has an imaginary friend did not lot onto this factor (factor loading: .20). The second construct ("FO Preferences") included four items from Singer and Singer's (1981) Imaginative Play and Predisposition Interview (i.e., favorite toy, favorite story, favorite TV show, what you like to do when by yourself) and two items from Gilpin's (2009) Fantasy Orientation Questionnaire (i.e., "what games does this child most enjoy playing", "rate this child's overall level of FO"; Eigenvalue = 2.216, factor loadings: .42-.59). In previous research, this factor has been called "FO Toys and Games" and only includes two items, one asking about a child's favorite toy and one asking about a child's favorite game. However, my factor includes additional items beyond children's favorite toys and games, so this factor was renamed "FO Preferences" for the present study. It should be noted that, typically, the first question on Singer and Singer's (1981) Imaginative Play and Predisposition Interview asking children to report their favorite game loads onto this factor. This question did not load onto the FO preferences factor (factor loading: .14), and therefore was not included. The third construct ("FO Pretense") included three items from Taylor and Carlson's (1997) Imaginary Companion and Impersonation Interview (i.e., "do you ever pretend to be an animal", "do you ever pretend to be a different person", "do you ever pretend to be anything else like a machine or plane or something like that"; Eigenvalue = 1.796, factor loadings: .40-.66).

Finally, previous research identified “FO Cognitions” as the fourth FO construct. However, no items loaded onto this factor in my data. All remaining items not mentioned above did not load onto any of the FO constructs identified.

The PCA of the Teacher Imagination Questionnaire identified two constructs. The first construct identified involves 18 questions assessing the *extent* to which a child engages in imagination and pretending (e.g., “how often down this child reenact story lines”, “does this child ever impersonate another character from a book/TV show”; Eigenvalue = 8.559, factor loadings: .47-.76). Thus, this construct was termed “FO Experience.” The second construct involves 4 questions assessing the extent to which a child appears to interact with an imaginary companion (e.g., “do you ever observe this child interacting with an imaginary companion”, “to what extent does this child engage in pretend interactions with invisible characters when playing alone”; Eigenvalue = 3.000, factor loadings: .51-.67). This construct was termed “FO Imaginary Companion”.

Based on the factors identified above, five constructs were created by averaging the z-scores of each measure in the component. All factors with their respective items are summarized in Appendix E. Descriptive statistics of these factors can be found in Table 12. Moving forward, all analyses use these FO constructs rather than individual FO items.

ER Composite. All of the measures of ER used in the present study were moderately to highly correlated (see Table 8). Descriptive statistics for these measures can be found in Table 7. A PCA confirmed that these three measures of ER (i.e., ERC Emotion Regulation subscale, ERC Lability/Negativity subscale, BRIEF-P Emotion Control subscale) load onto one single factor (Eigenvalue = 2.133, factor loadings: -.68, .93, and .90, respectively). Therefore, the z-scores of these three ER measures were averaged to create an overall ER composite variable. Note that the z-scores for the ERC Lability/Negativity and BRIEF-P Emotion Control subscales were multiplied by -1 before being averaged as higher scores on these measures indicated poorer emotion regulation skills. All following analyses will utilize this overall ER composite variable. Higher scores on the overall ER composite indicate better ER. Descriptive statistics of this Overall ER composite variable can be found in Table 12.

Table 7

Descriptive Statistics – Emotion Regulation Measures.

Measure	N	Possible Range	Actual Range	Mean	SD
ERC Regulation	285	1-4	1.25-4.00	3.06	.49
ERC Lability/Negativity	284	1-4	1.00-3.38	1.50	.44
BRIEF-P Emotion Control	293	10-30	10-28	12.64	3.93

Note. Higher scores on the BRIEF-P Emotion Control and ERC Lability/Negativity subscales indicate poorer ER.

Table 8

Correlations among Emotion Regulation Measures.

Measure	1.	2.	3.
1. ERC Regulation	1		
2. ERC Lability/Negativity	-.48**	1	
3. BRIEF-P Emotion Control	-.37**	.82**	1

Note. Higher scores on the BRIEF-P Emotion Control and ERC Lability/Negativity subscales indicate poorer ER. Light gray shading: **p* < .05; Dark gray shading: ***p* ≤ .01.

EF Composite. Because many of the EF measures used in the present study were correlated with one another (see Table 10), all eight measures/subscales were entered into one PCA (see Table 9 for descriptive statistics). These analyses revealed one single EF factor ("EF Performance"; Eigenvalue = 2.561). The four subscales of the BRIEF-P (i.e., Working Memory, Plan/Organize, Inhibit, Shift) all loaded onto this factor (factor loadings: .83, .85, .64, .44, respectively). The remaining child EF measures (i.e., Forward Digit Span, Card Sort Task, Grass/Snow Task, and Gift Task) did not load onto this factor (factor loadings: -.37, .29. -.00, .58, respectively). Thus it appears as though child EF data and teacher EF data are measuring different aspects of EF, as is consistent with previous literature (e.g., De Los Reyes, 2011; Gomez-Perez, Calera, Mata, & Molinero, 2016).

Table 9

Descriptive Statistics – Executive Function Measures.

Measure	N	Possible Range	Actual Range	Mean	SD
Forward Digit Span	204	0-7	0-7	3.80	1.12
Card Sort Errors after Switch	200	0-25	0-25	7.25	9.57
Grass/Snow	221	0-16	0-16	6.21	6.17
Gift Task Number of Peeks	201	0-∞	0-22	1.37	2.30
BRIEF-P Inhibit	292	13-39	13-38	18.72	5.52
BRIEF-P Shift	292	7-21	7-19	8.15	1.96
BRIEF-P Working Memory	292	17-51	17-50	25.85	7.67
BRIEF-P Plan/Organize	293	10-30	10-29	14.92	4.33

Note. Higher scores on the BRIEF-P indicate poorer EF outcomes.

Table 10

Correlations among Executive Function Measures.

Measure	1.	2.	3.	4.	5.	6.	7.	8.
1. Forward Digit Span	1							
2. Card Sort Errors after Switch	-.09	1						
3. Grass/Snow	.04	-.11	1					
4. Gift Task Number of Peeks	-.21**	.26**	-.06	1				
5. BRIEF-P Inhibit	-.15*	.17*	-.04	.33**	1			
6. BRIEF-P Shift	.03	.02	-.01	.08	.45**	1		
7. BRIEF-P Working Memory	-.22**	.03	-.05	.25**	.34**	.31**	1	
8. BRIEF-P Plan/Organize	-.17*	.04	-.01	.29**	.33**	.30**	.92**	1

Note. Higher scores on the BRIEF-P indicate poorer EF outcomes. Light gray shading: $*p \leq .05$; Dark gray shading: $**p \leq .01$.

Based on the above results, a separate PCA was run including only the four child EF measures. All but one of these measures loaded onto one factor ("EF Capacity"; Eigenvalue = 1.440). Specifically, Forward Digit Span highest number of digits successfully recalled, Card Sort Task errors after switch, and Gift Task number of peeks loaded onto this construct (factor loadings: -.56, .67, .75, respectively). Grass/Snow Task total scores did not load onto this factor (factor loading: -.35), likely due to the bimodal nature of scores on this measure.

EF Performance and EF Capacity constructs were created by averaging the z-scores of each measure in the component. The names EF Performance and EF Capacity were selected to represent the different aspects of EF measured by these two constructs. Specifically, EF Performance reflects how EF skills manifest during everyday activities, whereas EF Capacity reflects EF skills as they occur in controlled research settings. Descriptive statistics of these constructs can be found in Table 12. Higher scores on the EF Performance construct indicate poor EF skills, whereas higher scores on the EF capacity construct indicate better EF skills. Moving forward, all analyses use these two EF constructs rather than individual EF items.

Investigating Group Differences. Because participants were concurrently enrolled in a larger parent-project studying the effects of a socio-emotional intervention, differences between intervention and control conditions were analyzed across all variables of interest. A series of independent *t*-tests comparing intervention and control conditions were calculated. Variances were assumed to be equal unless Levene's Test for Equality of Variance was significant at the $p < .05$ level (only occurred with FO Entities construct). The two conditions did not differ on ER or EF. However, these conditions did vary across FO constructs. Specifically, children in the control condition scored significantly higher on the FO Entities construct, $t(288) = 2.46$, $p = .01$, and significantly lower on the FO Preferences, $t(138) = -2.81$, $p = .01$, and FO Imaginary Companion constructs, $t(279) = -2.96$, $p = .00$. See Table 11.

Table 11

Differences in Variables of Interest across Intervention Conditions.

Construct	**Condition**	**N**	**Mean**	**SD**	***t***	**Sig.**	***d***
FO Entities	Control	161	.09	.63	2.40	.02*	.28
	Intervention	129	-.11	.79			
FO Preferences	Control	81	-.11	.52	-2.81	.01**	.46
	Intervention	59	.13	.52			
FO Pretense	Control	124	.06	.83	1.11	.27	.15
	Intervention	96	-.07	.85			
FO Experience	Control	154	2.89	.65	-1.70	.09	.75
	Intervention	118	3.03	.75			
FO Imaginary Companion	Control	159	-.11	.73	-2.96	.00**	.20
	Intervention	122	.16	.84			
ER	Control	167	.03	.85	.567	.57	.07
	Intervention	114	-.03	.81			
SCL Baseline	Control	67	282.08	147.68	-1.03	.30	.18
	Intervention	63	307.17	129.49			
SCL Reactivity	Control	48	.10	.43	1.56	.12	.32
	Intervention	48	-.06	.55			
EF Performance	Control	153	.10	.78	1.25	.21	.16
	Intervention	110	-.02	.76			
EF Capacity	Control	97	-.04	.78	-.82	.41	.12
	Intervention	95	.04	.56			
PPVT Raw	Control	131	65.92	22.68	.14	.89	.02
	Intervention	98	65.51	23.73			

Note. Higher scores on EF Performance indicate poorer EF outcomes. $^{*}p \leq .05$; $^{**}p \leq .01$.

Although it is unlikely that the socio-emotional intervention incorporated in the larger parent-project would change a child's FO (Fehr, 2017; Pierucci et al., 2014; Thibodeau et al., 2016), as a precaution, these constructs were further evaluated. Specifically, independent-samples *t*-tests were calculated for each individual item in these FO constructs in order to determine what items were driving these significant differences between the intervention and control groups. For the FO Entities construct, only the items asking teachers to report children's beliefs in Santa Claus, the Easter Bunny, and the Tooth Fairy were significantly different between groups (all *t*'s > 2.77, all *p*'s < .01). Thus, these items were removed from the FO Entities construct. A new FO Entities construct was computed by averaging the z-scores of the remaining items in this factor. For the FO Preferences construct, only the item "what games does this child most enjoy playing" was significantly different between groups, $t(245) = -2.10$, $p = .04$. This item was removed from this construct, and the z-scores of the remaining items were averaged to create a new FO Preferences construct. Finally, all but one item of the FO Imaginary Companion construct were significantly different across conditions (all t's > -2.68, all p's < .01), so this construct was not used in further analyses.

After removing these items, the FO Entities and FO Preferences constructs no longer differed between intervention and control conditions, $t(290) = .63$, $p = .53$ and $t(156) = -1.7$, $p = .09$, respectively. Descriptive statistics and correlations for all final constructs can be found in Tables 12 and 13.

Table 12

Descriptive Statistics – Final Constructs.

Construct	N	Range	Mean	SD
FO Entities	292	-1.74-1.62	.00	.81
FO Preferences	158	-1.38-1.48	.00	.58
FO Pretense	220	-1.44-.69	.00	.74
FO Experience	272	1.00-4.89	2.95	.69
ER	281	-3.30-1.23	.00	.83
SCL Baseline	130	37.09-499.46	294.24	139.20
SCL Reactivity	96	-1.46-1.20	.02	.50
EF Performance	263	-.98-2.73	.05	.78
EF Capacity	192	-4.14-1.11	.00	.68
PPVT Raw	229	0-119	65.74	23.09

Note. Higher scores on EF Performance indicate poorer EF outcomes.

Table 13

Correlations among all Final Constructs.

Construct	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. FO Entities	1									
2. FO Preferences	.15	1								
3. FO Pretense	.03	-.15	1							
4. FO Experience	-.08	.04	-.12	1						
5. ER	-.05	.09	-.02	.20**	1					
6. SCL Baseline	.03	-.08	.07	.05	-.05	1				
7. SCL Reactivity	.10	.26	-.09	.08	-.01	.23*	1			
8. EF Performance	.01	-.11	.02	-.16*	-.68**	-.05	.02	1		
9. EF Capacity	-.02	.24**	-.08	.15*	.22**	.17	.11	-.33*	1	
10. PPVT Raw	-.09	.08	-.06	.13	.21**	.15	-.06	-.25**	.44**	1

Note. Higher scores on EF Performance indicate poorer EF outcomes. Light gray shading: *$p \leq .05$; Dark gray shading: **$p \leq .01$.

Main Analyses for Aim 1

In order to investigate FO as a moderator variable in the relationship between ER and EF, analyses were conducted following the guidelines given by Baron and Kenny (1986) using the PROCESS macro for SPSS (Hayes, 2012). Linear regression analyses were conducted on EF scores (Performance and Capacity) with ER and FO scores (Entities, Preferences, Pretense, and Experience, separately) entered on step 2 and the interaction vector of these constructs (ER x FO) on step 3. Age, gender, and PPVT raw scores were related to the variables of interest (see Tables 13-15). Therefore, step 1 included the following control variables: age, gender, and PPVT raw scores (as a proxy for intelligence).

Table 14

Differences in Variables of Interest across Age.

Construct	**Age**	**N**	**Mean**	**SD**	***t***	**Sig.**	***d***
FO Entities	4	197	.02	.82	.92	.36	.22
	5	18	-.17	.92			
FO Preferences	4	133	.03	.59	.26	.79	.11
	5	9	-.03	.55			
FO Pretense	4	179	.04	.75	1.57	.12	.39
	5	17	-.26	.79			
FO Experience	4	183	2.91	.64	-2.60	.01**	.75
	5	16	3.34	.50			
ER	4	187	-.09	.87	-1.40	.16	.34
	5	19	.20	.85			
SCL Baseline	4	89	298.55	144.27	.95	.35	.31
	5	10	252.76	153.93			
SCL Reactivity	4	61	.01	.54	.21	.84	.08
	5	8	-.03	.46			
EF Performance	4	183	.12	.80	2.27	.02*	.65
	5	18	-.32	.53			
EF Capacity	4	151	-.02	.73	-1.01	.32	.31
	5	14	.18	.57			
PPVT Raw	4	206	65.41	21.94	-2.07	.04	.45
	5	19	76.50	26.69			

Note. Higher scores on EF Performance indicate poorer EF outcomes. $*p \leq .05$; $**p \leq .01$.

Table 15

Differences in Variables of Interest across Gender.

Construct	**Gender**	**N**	**Mean**	**SD**	***t***	**Sig.**	***d***
FO Entities	Female	128	.02	.75	.36	.72	.05
	Male	164	-.02	.86			
FO Preferences	Female	71	.03	.52	.62	.54	.10
	Male	87	-.03	.63			
FO Pretense	Female	98	-.05	.79	-.94	.35	.12
	Male	122	.04	.71			
FO Experience	Female	118	2.99	.67	.82	.41	.10
	Male	154	2.92	.71			
ER	Female	126	.12	.82	2.22	.03*	.27
	Male	155	-.10	.84			
SCL Baseline	Female	53	310.45	142.82	1.10	.27	.20
	Male	77	283.08	136.46			
SCL Reactivity	Female	37	.01	.51	-.13	.90	.02
	Male	59	.02	.49			
EF Performance	Female	118	-.09	.74	-2.65	.01**	.33
	Male	145	.16	.79			
EF Capacity	Female	81	.14	.60	2.32	.02*	.35
	Male	111	-.09	.72			
PPVT Raw	Female	97	66.83	21.90	.61	.54	.08
	Male	132	64.95	23.97			

Note. Higher scores on EF Performance indicate poorer EF outcomes. $*p \leq .05$; $**p \leq .01$.

EF Performance. When examining the influence of FO and ER on EF Performance scores, results revealed partial support for the initial hypotheses. Specifically, FO Entities moderated the relationship between EF Performance and ER. The overall model was significant, $F(6, 183) = 34.82$, $p < .00$, $R^2 = .53$. See Table 16. Although there was not a significant main effect of FO Entities on EF Performance scores ($b = .03$, $t = -.69$, $p = .49$), there was a main effect of ER on EF Performance scores ($b = -.59$, $t = -12.82$, $p < .00$) such that higher ER predicted lower EF Performance scores (i.e., better EF skills). This finding is consistent with previous literature on the relationship between ER and EF (Carlson & Wang, 2007; Ursache et al., 2013). However, this main effect was qualified by a significant interaction between ER and FO Entities ($b = .17$, $t = 3.03$, $p < .01$). In other words, the observed relationship between ER and

EF Performance depended on the extent to which a child believed in various fantastical entities. Including this interaction in the model resulted in a significant change in R^2, $F(1, 183) = 9.18$, $p < .01$, $R^2_{change} = .02$.

Table 16

Hierarchical Linear Regression Analysis for ERxFO Entities on EF Performance.

Dependent Variable: EF Performance						
Model	Predictor	B	*SE* B	*t*	*p*	ΔR^2
1	Constant	1.79	.74	2.41	.02*	.09**
	Age	-.33	.18	-1.78	.08	
	Gender	.19	.11	1.75	.08	
	PPVT Raw	-.01	.00	-3.06	.00**	
2	Constant	.75	.56	1.34	.18	.42**
	Age	-.14	.14	-.99	.32	
	Gender	.06	.08	.67	.51	
	PPVT Raw	.00	.00	-1.68	.09	
	ER	-.59	.05	-12.48	.00**	
	FO Entities	-.05	.05	-1.07	.29	
3	Constant	.55	.55	1.01	.32	.02**
	Age	-.10	.13	-.71	.48	
	Gender	.06	.08	.72	.47	
	PPVT Raw	.00	.00	-1.42	.16	
	ER	-.60	.05	-12.82	.00**	
	FO Entities	-.03	.05	-.69	.49	
	ERxFO Entities	.17	.06	3.03	.00**	

Note. Higher scores on EF Performance indicate poorer EF outcomes. *$p \leq .05$; ** $p \leq .01$.

To further understand the relationship between ER and EF Performance, simple slopes were tested for low (-1 SD below the mean), medium (mean), and high (+1 SD above the mean) levels of FO Entities. The slopes for all three levels of FO Entities were significant ($b_{low} = -.74$, $SE_{b\text{-}low} = .07$, $p < .00$; $b_{medium} = -.59$, $SE_{b\text{-}medium} = .05$, $p < .00$; $b_{high} = -.45$, $SE_{b\text{-}high} = .07$, $p < .00$). Following the guidelines given by Robinson, Tomek, and Schumacker (2013), differences in these simple slopes were examined using the following formula: $t(n_1+n_2-2) = (b1-b2)/\sqrt{(n_1SE_{b1}{}^2+n_2SE_{b2}{}^2)/(n_1+n_2-2)}$. These calculations revealed that the slope for low levels of FO Entities ($b_{low} = -.74$) was significantly steeper than the slope for high levels of FO Entities (b_{high}

= -.45), $t(54) = -4.07$, $p < .01$, and significantly steeper than the slope for medium levels of FO Entities ($b_{medium} = -.59$), $t(164) = -2.74$, $p = .01$. In addition, the slope for medium levels of FO Entities ($b_{medium} = -.59$) was significantly steeper than the slope for high levels of FO Entities ($b_{high} = -.45$), $t(156) = -2.60$, $p = .01$. In other words, having a medium to high FO Entities score significantly attenuated the relationship between ER and EF Performance. See Figures 4a and 4b.

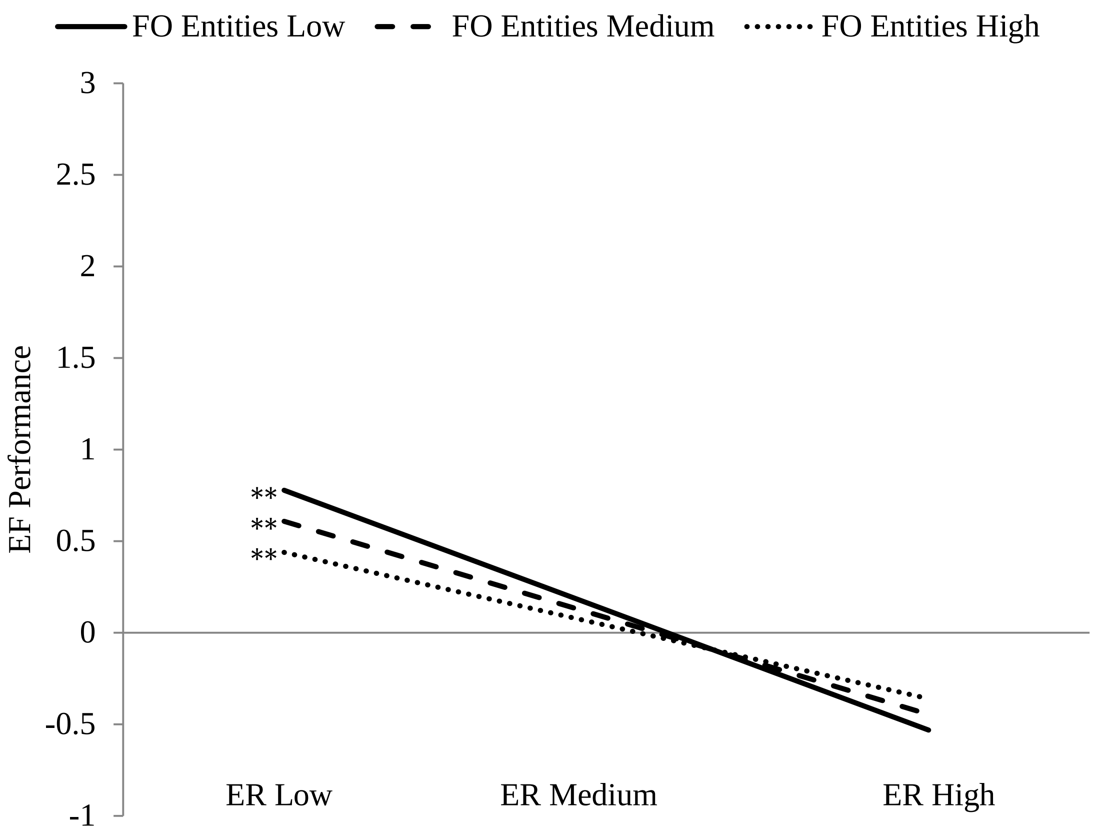

Figure 4a. FO Entities moderating the relationship between ER and EF Performance. Higher scores on EF Performance indicate poorer EF outcomes. Estimates are based on setting covariates to their sample means. $^{**}p \leq .01$.

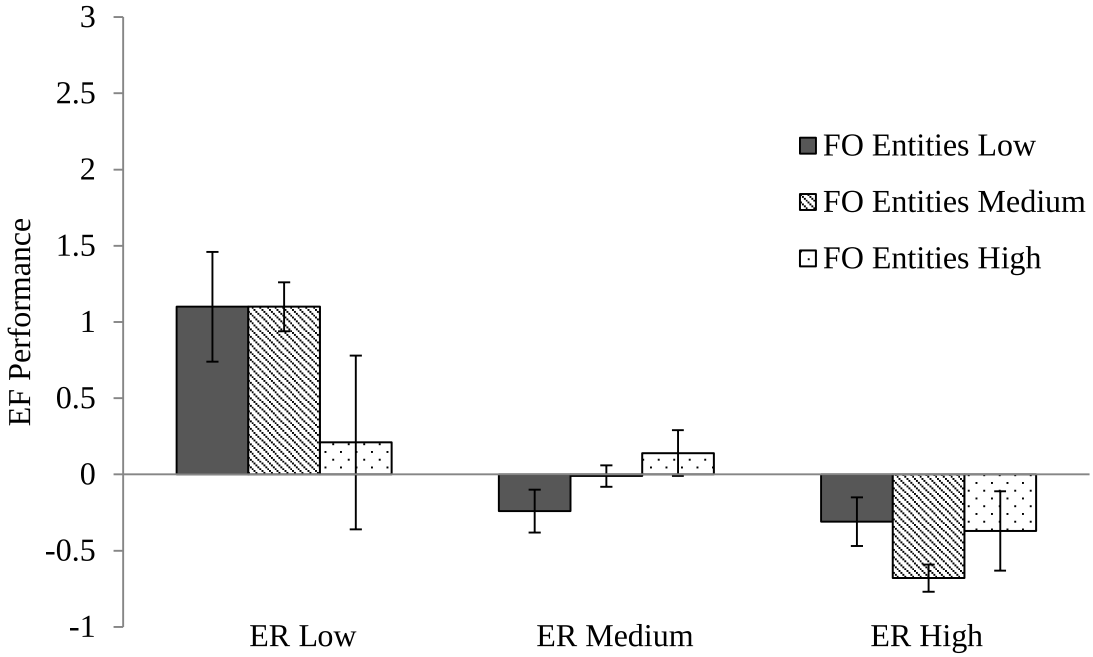

Figure 4b. EF Performance scores compared across FO Entities and ER levels controlling for age, gender, and vocabulary. Higher scores on EF Performance indicate poorer EF outcomes.

By visualizing this interaction differently, we obtain further details about the protective nature of FO Entities as a positive psychological context. Simple slopes were tested for low (-1 SD below the mean), medium (mean), and high (+1 SD above the mean) levels of ER. Only the slope for low levels of ER was significant ($b_{low} = -.20$, $SE_{b\text{-}low} = .07$, $p < .01$). In other words, among children with poor ER skills, EF Performance scores depend on the extent to which children believe in fantastical entities, with those who believe in more fantastical entities scoring better on this measure of EF Performance. The slopes for medium levels of ER ($b_{medium} = -.05$, $SE_{b\text{-}medium} = .05$, $p = .30$) and high levels of ER ($b_{high} = .10$, $SE_{b\text{-}high} = .07$, $p = .14$) were not significant. See Figures 5a and 5b. For participant distributions across ER and FO Entities levels, see Appendix F.

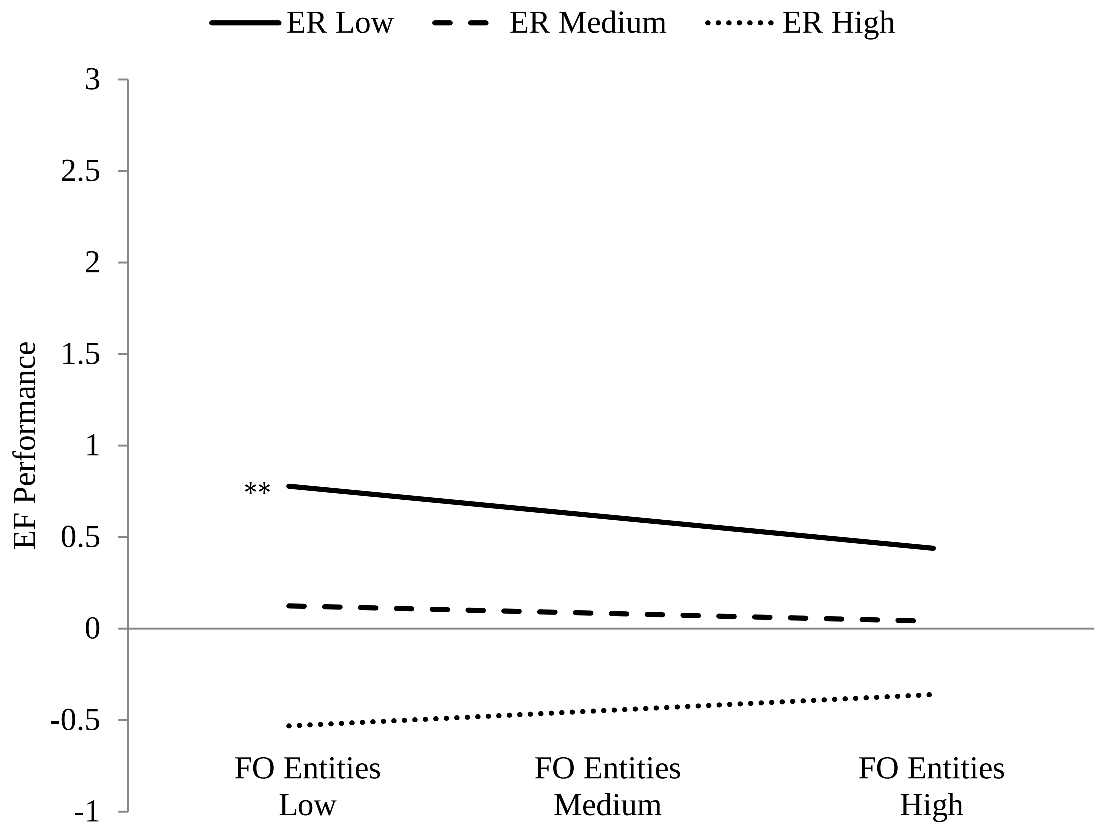

Figure 5a. Interaction between FO Entities and ER on EF Performance. Higher scores on EF Performance indicate poorer EF outcomes. Estimates are based on setting covariates to their sample means. $^{**}p \leq .01$.

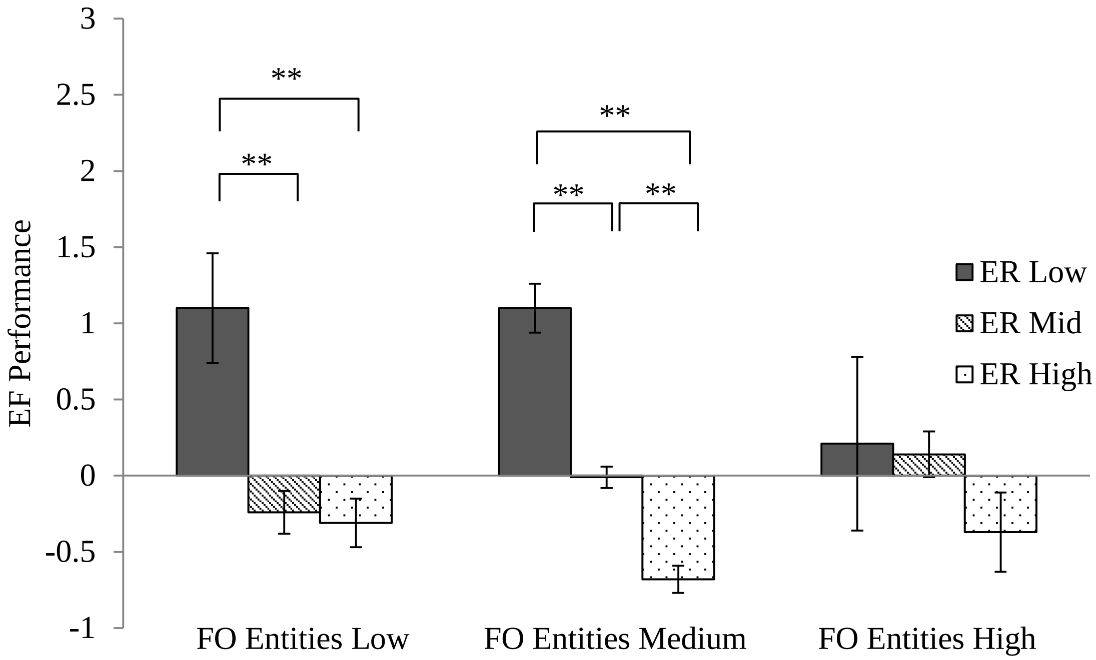

Figure 5b. EF Performance scores compared across FO Entities and ER levels controlling for age, gender, and vocabulary. Higher scores on EF Performance indicate poorer EF outcomes. **$p \leq .01$.

There were no significant interactions between ER and FO Preferences, FO Pretense, or FO Experience on EF Performance scores. See Appendix I for non-significant regression results.

EF Capacity. Moderation analyses indicated that there were no significant interactions between ER and FO Entities, FO Preferences, FO Pretense, or FO Experience on ER Capacity scores. See Appendix I for non-significant regression results.

Main Analyses for Aim 2

In order to investigate FO as a moderator variable in the relationship between SCL Reactivity and EF, analyses were conducted following the guidelines given by Baron and Kenny (1986) using the PROCESS macro for SPSS (Hayes, 2012). Linear regression analyses were conducted on EF scores (Performance and Capacity) with SCL Reactivity and FO scores (Entities, Preferences, Behavior, and Experience, separately) entered on step 2 and the interaction vector of these constructs (SCL Reactivity x FO) on step 3. Age, gender, and PPVT raw scores were related to the variables of interest (see Tables 13-15). Therefore, step 1 included the following control variables: age, gender, and PPVT raw scores as a proxy for intelligence. Because baseline levels of arousal were related to SCL Reactivity scores (see Table 13), I also controlled for a child's baseline level of arousal by including SCL baseline scores as a covariate on step 1.

EF Performance. Regression analyses revealed that FO Pretense moderated the relationship between EF Performance and SCL Reactivity, controlling for baseline levels of arousal. The overall model was marginally significant, $F(7, 44) = 2.04$, $p = .07$, $R^2 = .25$. See Table 17. There was neither a main effect of FO Pretense on EF Performance scores ($b = -.10$, $t = -.63$, $p = .53$), nor a main effect of SCL Reactivity on EF Performance scores ($b = -.13$, $t = -.58$, $p = .57$). However, there was a significant interaction between SCL Reactivity and FO Pretense ($b = .83$, $t = 2.35$, $p < .05$). In other words, the observed relationship between SCL Reactivity and EF Performance depended on a child's propensity for engaging in various pretending behaviors (i.e., pretending to be animal, person, something else). Including this interaction in the model resulted in a significant change in R^2, $F(1, 44) = 5.52$, $p < .05$, $R^2_{change} = .10$.

Table 17

Hierarchical Linear Regression Analysis for SCLxFO Pretense on EF Performance.

Dependent Variable: EF Performance						
Model	Predictor	B	*SE* B	*t*	*p*	ΔR^2
1	Constant	1.62	1.32	1.23	.22	.13
	Age	-.38	.32	-1.19	.24	
	Gender	.44	.22	1.96	.06	
	PPVT Raw	.00	.01	.00	1.00	
	SCL Baseline	.00	.00	-1.20	.24	
2	Constant	1.95	1.36	1.43	.16	.03
	Age	-.47	.33	-1.41	.17	
	Gender	.48	.23	2.10	.04*	
	PPVT Raw	.00	.01	-.08	.94	
	SCL Baseline	.00	.00	-.93	.36	
	SCL Reactivity	-.07	.24	-.29	.77	
	FO Pretense	-.19	.16	-1.13	.26	
3	Constant	1.67	1.30	1.28	.21	.10*
	Age	-.38	.32	-1.19	.24	
	Gender	.44	.22	2.00	.05*	
	PPVT Raw	.00	.01	-.14	.89	
	SCL Baseline	.00	.00	-1.13	.27	
	SCL Reactivity	-.13	.23	-.58	.57	
	FO Pretense	-.10	.16	-.63	.53	
	SCL Reactivity x FO Pretense	.83	.35	2.35	.02*	

Note. Higher scores on EF Performance indicate poorer EF outcomes. $*p \leq .05$.

To further understand the relationship between SCL Reactivity and EF Performance, simple slopes were tested for low (-1 SD below the mean), medium (mean), and high (+1 SD above the mean) levels of FO Pretense. Only the slope for low levels of FO Pretense was marginally significant ($b_{low} = -.66$, $SE_{b\text{-}low} = .34$, $p = .06$). In other words, among children who have a low propensity for engaging in pretending behaviors, EF Performance scores depended on a child's physiological reactivity to stressful situations, with those who have a high reactivity scoring the best on this measure of EF. The slopes for medium levels of FO Pretense ($b_{medium} = -.09$, $SE_{b\text{-}medium} = .22$, $p = .70$) and high levels of FO Pretense ($b_{high} = .45$, $SE_{b\text{-}high} = .31$, $p = .16$) were not significant. See Figures 6a and 6b.

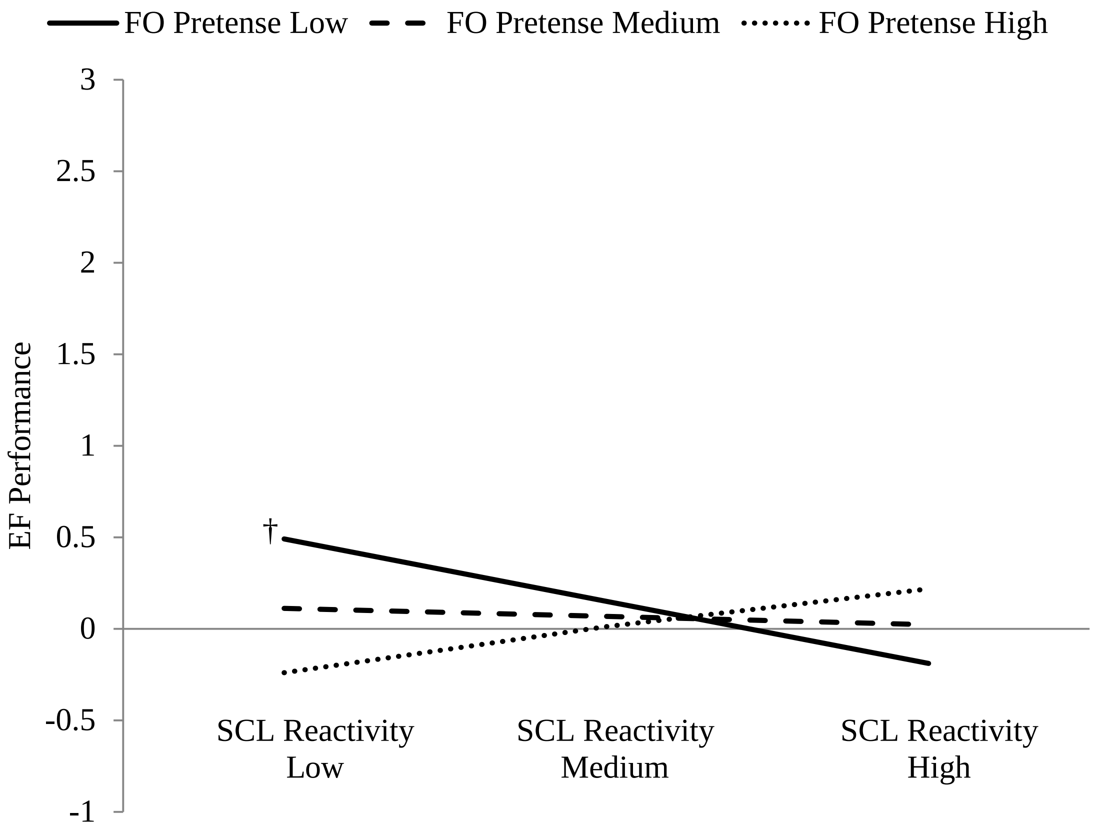

Figure 6a. FO Pretense moderating the relationship between SCL Reactivity and EF Performance. Higher scores on EF Performance indicate poorer EF outcomes. Estimates are based on setting covariates to their sample means. † $p \leq .06$.

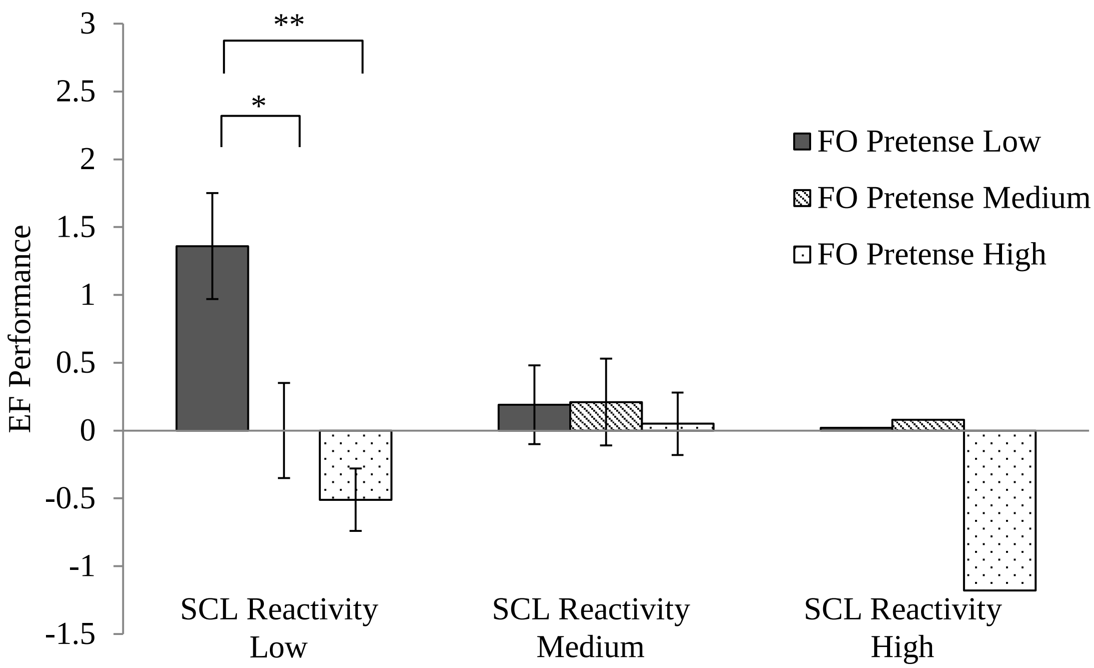

Figure 6b. EF Performance scores compared across FO Pretense and SCL Reactivity levels controlling for age, gender, vocabulary, and baseline SCL arousal scores. Higher scores on EF Performance indicate poorer EF outcomes. *$p \leq .05$; **$p \leq .01$.

By visualizing this interaction differently, we are able to gain more insight into whether or not FO is serving as a positive context under the biological sensitivity to context framework. Simple slopes were tested for low (-1 SD below the mean), medium (mean), and high (+1 SD above the mean) levels of SCL Reactivity. Only the slope for low levels of SCL reactivity was significant ($b_{low} = -.55$, $SE_{b\text{-}low} = .22$, $p < .05$). In other words, among children with low levels of SCL Reactivity in response to challenging situations, EF Performance scores depend on a child's propensity for engaging in various pretending behaviors, with those who have a higher propensity towards engaging in pretending behaviors performing the best on this measure of EF Performance. The slopes for medium levels of SCL Reactivity ($b_{medium} = -.12$, $SE_{b\text{-}medium} = .16$, $p = .45$) and high levels of SCL Reactivity ($b_{high} = .31$, $SE_{b\text{-}high} = .26$, $p = .25$) were not significant.

See Figures 7a and 7b. For participant distributions across SCL and FO Pretense levels, see Appendix G.

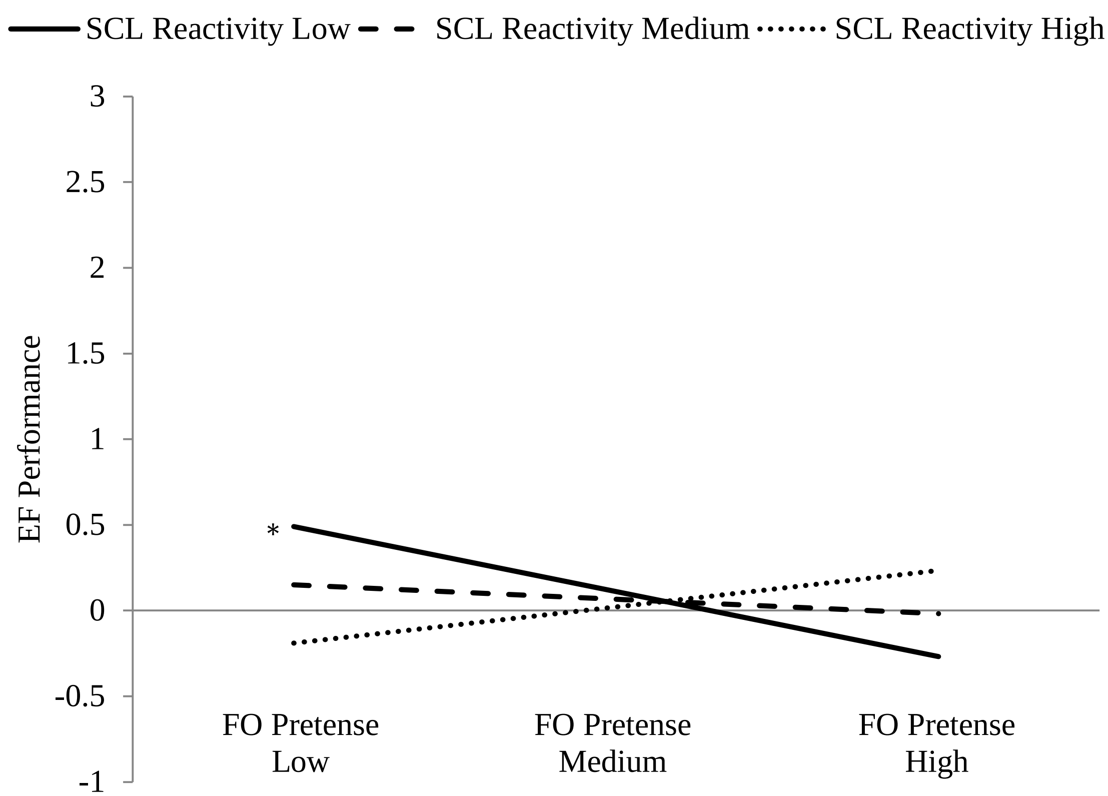

Figure 7a. Interaction between FO Pretense and SCL Reactivity on EF Performance. Higher scores on EF Performance indicate poorer EF outcomes. Estimates are based on setting covariates to their sample means. *$p \leq .05$.

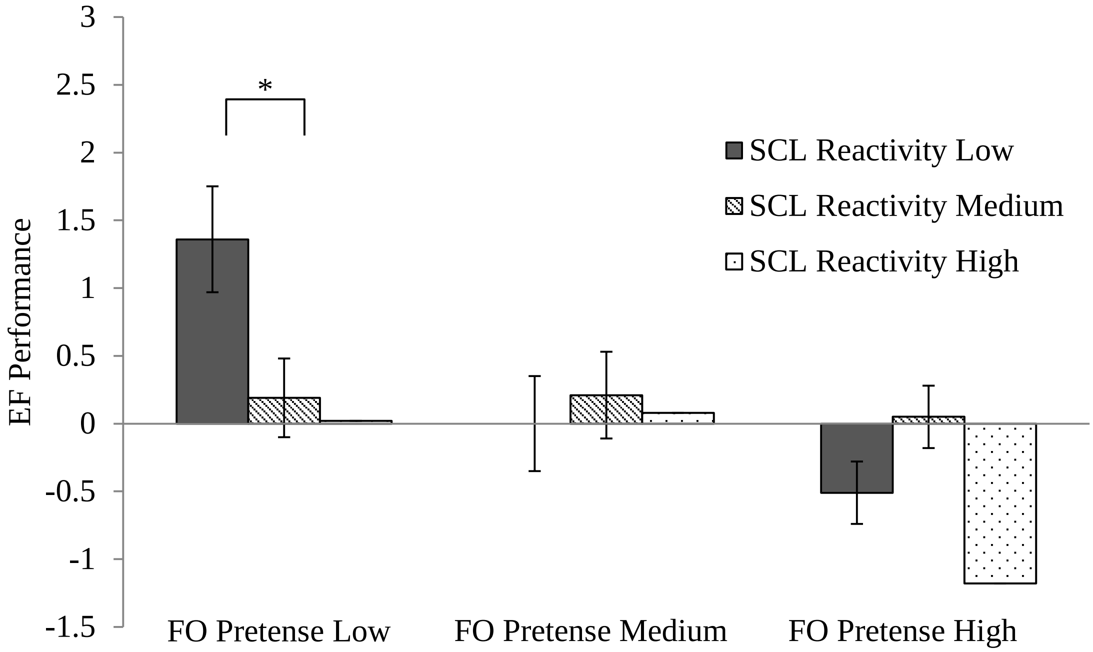

Figure 7b. EF Performance scores compared across FO Pretense and SCL Reactivity levels controlling for age, gender, vocabulary, and baseline SCL arousal scores. Higher scores on EF Performance indicate poorer EF outcomes. *$p \leq .05$.

There were no significant interactions between SCL Reactivity and FO Entities, FO Preferences, or FO Experience on EF Performance scores. See Appendix I for non-significant regression results.

EF Capacity. Moderation analyses indicated that there were no significant interactions between SCL Reactivity and FO Entities, FO Preferences, FO Pretense, or FO Experience on ER Capacity scores. See Appendix I for non-significant regression results.

Exploratory Analyses

Based on previous literature that demonstrates a relationship between pretend-play and both EF (Carlson et al., 2014; Pierucci et al., 2014; Thibodeau et al., 2016) and ER (Galyer & Evans, 2006; Gilpin et al., 2015), it could be argued that FO is influencing EF through its relationship with ER. In other words, it is possible that having a high FO could lead to better ER skills, which in turn could lead to enhanced EF. An underlying assumption of mediation models like the one just described is that X is related to both M and Y, and M is related to Y. Thus, FO needed to be correlated with both ER and EF, and ER needed to be correlated with EF to justify mediation analyses (Baron & Kenny, 1986). Based on this assumption, I did not have grounds to run mediation analyses for FO Entities, FO Preferences, or FO Pretense. Only FO Experience was related to both ER and EF (see Table 13). In order to test ER as a mediator in the relationship between FO Experience and EF, two hierarchical linear regression analyses on EF scores (i.e., performance and capacity, respectively) were run with possible covariates (i.e., age, gender, PPVT raw scores) entered on step 1, FO Experience scores entered on step 2, and ER scores entered on step 3. Emotion regulation did not mediate the relationship between FO Experience and EF Performance or EF Capacity (see Table 18).

Similarly, it could be argued that only children with certain ER skills could engage in FO behaviors and cognitions, and that engaging in FO behaviors and cognitions would in turn influence EF outcomes. Thus, FO was also tested as a mediator in the relationship between ER and EF. Again, mediation analyses were only conducted with FO Experience scores with covariates (i.e., age, gender, and PPVT raw scores) entered on step 1, ER scores entered on step 2, and FO Experience scores entered on step 3. Fantasy orientation did not mediate the relationship between ER and EF Performance or EF Capacity (see Table 19). Physiological reactivity scores were not related to any FO or EF constructs, so no mediation analyses were conducted for these variables.

Table 18

Hierarchical Linear Regression Analyses for ER as a Mediator.

Model	Predictor	B	*SE* B	*t*	*p*
Dependent Variable: EF Performance					
1	Constant	1.70	.78	2.17	.03*
	Age	-.31	.19	-1.60	.11
	Gender	.14	.12	1.21	.23
	PPVT Raw	-.01	.00	-2.63	.01**
2	Constant	1.86	.78	2.37	.02
	Age	-.25	.20	-1.25	.21
	Gender	.14	.12	1.26	.21
	PPVT Raw	-.01	.00	-2.36	.02*
	FO Experience	-.16	.10	-1.68	.10
3	Constant	.70	.59	1.18	.24
	Age	-.11	.15	-.74	.46
	Gender	.03	.09	.35	.73
	PPVT Raw	.00	.00	-1.38	.17
	FO Experience	-.03	.07	-.40	.69
	ER	-.58	.05	-11.69	.00**
Dependent Variable: EF Capacity					
1	Constant	-.73	.68	-1.07	.29
	Age	.01	.17	.06	.95
	Gender	-.08	.10	-.78	.44
	PPVT Raw	.01	.00	4.92	.00**
2	Constant	-.82	.69	-1.20	.23
	Age	-.04	.17	-.21	.84
	Gender	-.07	.10	-.69	.49
	PPVT Raw	.01	.00	4.82	.00**
	FO Experience	.10	.09	1.17	.25
3	Constant	-.70	.68	-1.02	.31
	Age	-.05	.17	-.27	.79
	Gender	-.05	.10	-.51	.61
	PPVT Raw	.01	.00	4.68	.00**
	FO Experience	.08	.09	.93	.36
	ER	.09	.06	1.46	.15

Note. Higher scores on EF Performance indicate poorer EF outcomes. *$p \leq .05$; **$p \leq .01$.

Table 19

Hierarchical Linear Regression Analyses for FO as a Mediator.

Model	Predictor	B	*SE* B	*t*	*p*
Dependent Variable: EF Performance					
1	Constant	1.70	.78	2.17	.03*
	Age	-.31	.19	-1.60	.11
	Gender	.14	.12	1.21	.23
	PPVT Raw	-.01	.00	-2.63	.01**
2	Constant	.67	.58	1.14	.26
	Age	-.12	.14	-.82	.41
	Gender	.03	.09	.33	.74
	PPVT Raw	.00	.00	-1.44	.15
	ER	-.58	.05	-11.93	.00**
3	Constant	.70	.59	1.18	.24
	Age	-.11	.15	-.74	.46
	Gender	.03	.09	.35	.73
	PPVT Raw	.00	.00	-1.38	.17
	ER	-.58	.05	-11.69	.00**
	FO Experience	-.03	.07	-.40	.69
Dependent Variable: EF Capacity					
1	Constant	-.73	.68	-1.07	.29
	Age	.01	.17	.06	.95
	Gender	-.08	.10	-.78	.44
	PPVT Raw	.01	.00	4.92	.00**
2	Constant	-.62	.68	-.91	.37
	Age	-.01	.17	-.07	.95
	Gender	-.06	.10	-.56	.58
	PPVT Raw	.01	.00	4.75	.00**
	ER	.10	.06	1.63	.11
3	Constant	-.70	.68	-1.02	.31
	Age	-.05	.17	-.27	.79
	Gender	-.05	.10	-.51	.61
	PPVT Raw	.01	.00	4.68	.00**
	ER	.09	.06	1.46	.15
	FO Experience	.08	.09	.93	.36

Note. Higher scores on EF Performance indicate poorer EF outcomes. *$p \leq .05$; **$p \leq .01$.

DISCUSSION

The purpose of the present study was to investigate if FO, or a child's natural proclivity towards imaginative cognitions and behaviors, served as a protective factor to minimize deficits in EF among at-risk children in Head Start preschools. Specifically, FO was examined as a moderator the relationship between a child's ER and EF (Aim 1) as well as a moderator in the relationship between a child's physiological reactivity to stress and their EF (Aim 2). For Aim 1 of the present study, it was hypothesized that better EF outcomes would be observed among children who were low in ER but high in FO whereas EF outcomes would remain poor among children who were low in ER and low in FO. Similar to the results obtained by Ursache and colleagues (2013), I did not expect to see any significant differences in EF outcomes among children who were exhibiting mid to high ER, regardless of their level of FO. Regarding Aim 2, based on the biological sensitivity to context framework which hypothesizes maladaptive outcomes among children who are in at-risk settings and have a high physiological reactivity to their context (Boyce, 2007; Boyce & Ellis, 2005; Ellis & Boyce, 2008; Obradovic et al., 2010), it was hypothesized that a high FO would compensate for some of the negative environmental contexts children in the present study may experience. Specifically, it was expected that better EF outcomes would be observed among children who were highly reactive but high in FO whereas EF outcomes would remain poor among children who were highly reactive and low in FO. Again, I did not anticipate seeing any significant differences in EF outcomes among children who were exhibiting mid to low physiological stress reactivity, regardless of their level FO

(Ursache et al., 2013). The results of the current study demonstrated partial support for the initial hypotheses. The results from Aim 1 will be discussed first, followed by the results from Aim 2.

Aim 1: Does FO Moderate the Relationship between ER and EF

The results for Aim 1 partially supported initial hypotheses. Specifically, FO Entities interacted with ER to influence EF skills (i.e., EF Performance) among at-risk Head Start preschoolers, even after controlling for age, gender, and vocabulary (as a proxy for IQ). Overall, ER was positively associated with EF such that high ER related to high EF, whereas low ER was associated with low EF. However, this relationship was significantly attenuated among children who had a high propensity for believing in various fantastical entities (e.g., ghosts, dragons, fairies). As expected, FO only influenced performance among children with low ER skills. Post-hoc analyses indicated that among children with low levels of emotion regulation, those that had a high propensity towards believing in fantastical entities tended to perform better on the measure of EF Performance than their peers who had a medium to low propensity towards believing in fantastical entities (see Figure 4b). In other words, FO appears to be serving as a protective factor for children who have poor emotion regulation skills. Although these differences were only marginal, the lack of significance was likely due to the small sample sizes in these subsets of children (see Table 20 in Appendix F). For example, there were only two children in my sample that had both low ER and a high FO Entities score. It is expected that more pronounced differences will emerge with a larger sample. It is not surprising that I did not find differences in EF Performance scores across levels of FO when children had medium to high levels of ER because these children already had relatively high levels of EF when compared to their peers with low ER.

Aim 2: Does FO Moderate the Relationship between Physiological Reactivity and EF

Similar to Aim 1, the results for Aim 2 partially supported initial hypotheses. There was a meaningful interaction between FO Pretense and physiological reactivity scores (i.e., SCL) on EF outcomes (i.e., EF Performance), even after controlling for age, gender, vocabulary, and baseline reactivity scores. However, the direction of this interaction was opposite from what was initially hypothesized. Because children in my sample are from at-risk, low-income environments, I expected that high levels of physiological reactivity would relate to poorer EF outcomes (see Dandelion vs. Orchid Hypothesis; Boyce, 2007; Boyce & Ellis, 2005; Ellis & Boyce, 2008). Thus it was originally hypothesized that better EF performance would be observed among children who were highly reactive but high in FO whereas EF performance would remain poor among children who were highly reactive and low in FO. I did not expect to see differences in EF performance depending on a child's level of FO among children with medium to low levels of physiological reactivity (Ursache et al., 2013). Contrary to these expectations, the data demonstrated that FO only influenced EF outcomes among children with low physiological reactivity in response to challenging situations. In line with my conceptualization of FO serving as a positive context, post-hoc analyses indicated that children with low SCL reactivity performed the best on the measure of EF Performance when they had medium to high levels of FO (i.e., FO Pretense – propensity to engage in pretending behaviors like pretending to be an animal or a different person). Children with low SCL reactivity performed substantially worse than their peers on this measure of EF when they had low levels of FO Pretense (see Figure 6b). Differences in EF outcomes were not observed among children who had medium to high levels of SCL reactivity.

One possible explanation for this unexpected pattern of findings is that consistently engaging in imaginative behaviors may actually change a child's sensitivity to their context (Ellis, Essex, & Boyce, 2005). In other words, consistently engaging in pretend-play behaviors (i.e., high FO Pretense), which are hypothesized to be physiologically arousing, may decrease a child's sensitivity to the maladaptive or volatile environment around them because they have practice regulating through stressful situations in a safe context through their pretend-play. In support of this stance, there was only one child in my sample who had both high levels of physiological reactivity and a high FO Pretense score (see Table 21 in Appendix G). There was a larger proportion of children who had a high FO Pretense score and demonstrated low levels of physiological reactivity. However, I did not find evidence of physiological reactivity as a mediator between FO and EF outcomes. Although we may not have the power to detect such a mediation, nonetheless we cannot conclude from the present data that a high level of FO leads to lower levels of physiological reactivity, which in turn predicts better EF outcomes. In addition, to support the idea that FO is actually changing a child's sensitivity to their context, I would first need more substantial evidence that engaging in imaginative activities evokes a physiological response. One way to test this in future research would be to record physiological arousal as a child undergoes an "imagination challenge" task (e.g., asking the child to make up a story on the spot).

An alternative possibility that is perhaps more consistent with the biological sensitivity to context framework is that children in the present study may not be as "at-risk" as initially hypothesized. The initial hypothesis was formed under the assumption that children in my sample were from at-risk, maladaptive environments. According to the biological sensitivity to context theory, we would expect to see poorer outcomes (and thus a greater effect of FO) among children who have a high physiological reactivity (vs. low physiological reactivity) in maladaptive contexts (Boyce, 2007; Boyce & Ellis, 2005; Ellis & Boyce, 2008; Obradovic et al., 2010). My data, in fact, demonstrated the opposite. By contrast, the biological sensitivity to context theory also predicts that when children are in more supportive environments, poorer outcomes will be observed among children who have a low physiological reactivity (vs. high physiological reactivity), likely because they are not responsive to the enriching environment around them (Boyce, 2007; Boyce & Ellis, 2005; Ellis & Boyce, 2008). Therefore, in more supportive environments, we would expect to see the greatest influence of FO among children with low levels of reactivity. This is precisely what I found in the present data.

Although children enrolled in the current study were unquestionably from low-income families, it is unclear whether this low-income status was combined with other factors (e.g., parental stress/depression, threatening life experiences, chaotic home environment) that may put a child at risk for atypical development (Burchinal, Roberts, Hooper, & Zeisef, 2000; Evans, Li, & Whipple, 2013; Sameroff, Seifer, Barocas, Zax, & Greenspan, 1987). Rather, the children participating in the present study were all enrolled in a preschool program that provides children with a safe environment, opportunities for peer interaction, stimulating learning experiences, daily nutrition, and even support for parents (Department of Health and Human Services Administration for Children and Families, 2016). With this in mind, it is possible that children in my sample who exhibit low levels of physiological reactivity, or a low sensitivity to context, may not be responding to the enriching environment around them. In other words, these particular children may not be reaping the benefits of the instruction and peer interaction, among many other things, afforded by their Head Start preschool. Engaging in imaginative pretend-play (e.g., pretending to be an animal, pretending to be another person) may be one way these children with a low sensitivity to context are able to engage with and thus benefit from their environment. Thus a propensity towards these imaginative play behaviors (i.e., FO Pretense) would be developmentally beneficial for children with low levels of reactivity in a Head Start setting. This not only explains why I found an effect of FO at low but not medium to high levels of physiological reactivity, but also explains why I found better EF outcomes among children with low SCL reactivity who exhibit medium to high levels of FO Pretense when compared to their low SCL reactivity peers who exhibit low levels of FO Pretense (see Figure 6b).

FO Components Differentially Influence Outcomes

One of the innovations of the present study is that the data collected allow us to delineate what aspects of imagination and pretend-play are most important for development. Recent evidence suggests certain aspects associated with a pretend-play environment are optimal in order for children to reap the most benefits from their play (Russ, 2016; Thibodeau et al., 2016; Weisberg, 2016). This body of research collectively suggests the following: 1) It is important that pretend-play episodes are child driven. In other words, pretend-play should not be so structured (e.g., giving children a script that they are not allowed to deviate from) that children are not given any freedom to generate their own imaginative themes within the play. Allowing children to generate their own scripts throughout the pretend-play episode is important to increase the cognitive complexity of the play. 2) Pretend-play episodes should be guided by adults (Fehr & Russ, 2016). Although imaginative themes should be generated by the child (i.e., child driven) throughout the play, adults should provide scaffolding and encouragement throughout the entire play episode in order to sustain children’s involvement in the pretending process. For example, in a classroom environment, a teacher may initiate the pretend-play process by telling children they are going to pretend to go to the moon. From this point on, the children should generate the script for what they are pretending to do/see. Throughout the play, the teacher can further facilitate involvement by pretending along with the children and asking the children questions such as “what do you see over there.” 3) Finally, pretend-play appears to be most beneficial when it is highly imaginative (i.e., fantastical). Complex, fantastical play likely requires additional cognitive flexibility. In fact, children who engage in this cognitively sophisticated fantastical play (e.g., pretending to be a superhero flying in a magical land) show greater gains in cognitive development than children who engage in pretend-play that is rooted in reality (e.g., pretending to cook at meal; Thibodeau et al., 2016).

Data from the present study support and add to this body of work. First of all, in Aim 1 I found that ER only interacted with FO Entities to influence EF Performance outcomes. EF Performance and ER are arguably cognitively controlled skills. Although ER likely occurs largely outside of conscious awareness in infancy and toddlerhood (Blair, 2016), over time, as children learn from their parents how to appropriately regulate their emotional responses in various contexts, ER becomes a more cognitively controlled and intentional process (Sroufe, 1996). Interestingly, FO Entities likely requires the most cognitive processing of all the FO constructs found in the present study. It is not unreasonable to assume that believing in fantastical entities like fairies and ghosts involves a great deal of cognitive flexibility. For example, comprehending the omnipresence of fantastical entities likely taxes working memory, inhibition, and attention shift as a child suspends reality to focuses on an alternative schema of the world. Given the cognitive nature of FO Entities, it is possible that this construct was the most sensitive to differences in ER and EF Performance, explaining why it was the only FO construct to moderate the relationship between ER and EF. In support of this idea, Pierucci and colleagues (2014) only found positive associations between EF and FO among cognitively driven

FO components (i.e., FO Cognitions and FO Entities). All other FO components were either negatively or not associated with EF (Pierucci et al., 2014).

By contrast, only FO Pretense interacted with physiological reactivity to influence EF Performance in Aim 2 of the current study. As discussed above, low physiological reactivity may reflect a lack of engagement with the surrounding environment. FO Pretense, or engaging in pretending behaviors, may be one way children with low physiological reactivity are able to interact with and thus receive benefits from their environment. Given this explanation, it is not surprising that I did not find an effect of FO Entities on the relationship between physiological reactivity and EF, because FO Entities involves more internally driven, cognitive processes. However, this explanation will need to be investigated further in future research (e.g., pretend-play intervention studies).

The differences found with regard to which FO constructs interact with ER and physiological reactivity might also be explained by top-down and bottom-up processing theories. Bottom-up processing is often considered to be stimulus driven whereas top-down processing is considered to be more volitional, or cognitively controlled (Blair, 2016; McRae, Misra, Prasad, Pereira, & Gross, 2012; Ursache, Blair, & Raver, 2012). Although there are both bottom-up and top-down aspects to ER (Ursache et al., 2012), ER as it was measured in the present study can largely be considered a top-down process. For example, teachers in the present study reported on children's emotional responses to a variety of everyday scenarios, such as a peer taking a toy away from a child. ER, in this example, occurs as a result of a child trying to interpret the situation of the their toy being taken. If they interpret this situation as threatening, they will likely display a negative emotional response. However, if they do not interpret the taking of the toy to be threatening, they may not respond in an emotional manner. In other words, the act of the toy being taken (i.e., the stimulus) is not what is driving the emotional response. Rather the child's interpretation of the situation is driving the child's ER. In this way, ER could be considered a top-down process. Interestingly, FO Entities is also cognitively driven and thus likely requires top-down processing. On the other hand, a child's physiological response to stressful situations is arguably a bottom-up process, as it is stimulus driven and biologically based. Engaging in pretending behaviors (i.e., FO Pretense) is mostly stimulus driven (e.g., interacting with fellow children or available props) and does not necessarily require the same cognitive processing as other FO components (e.g., FO Entities; Pierucci et al., 2014).

It is interesting to note that FO Preferences and FO Experience did not interact with ER or physiological reactivity to influence EF outcomes. FO Preferences, or a child's propensity to self-select books, toys, and TV shows that are fantastical in nature, captures an aspect of FO that is more passive in nature. For example, watching a TV show that is fantastical in nature may not involve the same cognitive resources and behavioral interaction with the environment that are inherent in FO Entities and FO Pretense. In fact, FO Toys and Games, one aspect of the FO Preferences construct in the present study, is negatively associated with EF outcomes in previous literature (Pierucci et al., 2014). Thus is seems active involvement in imaginative behaviors and cognitions is likely necessary for observed benefits. With regards to FO Experience, all items from the Teacher Imagination Questionnaire loaded onto one factor (i.e., FO Experience), with the exception of four items that loaded onto FO Imaginary Companion which was not included in analyses. Because each FO component seems to be individually predictive of outcomes in the present study as well as EF skills in previous work (Pierucci et al., 2014), it is possible that this scale of overall experience with FO is too broad to capture any differences in performance.

Moving forward, it will be important to further investigate whether there are potentially meaningful subscales within this newly developed Teacher Imagination Questionnaire.

In summary, it seems as though a behavioral aspect of pretend-play is crucial for children who have a low physiological sensitivity to their context whereas a cognitive aspect of pretend-play is crucial for children who have trouble regulating their emotions. Implications of these findings are discussed in the Practical Implications section below.

EF Performance vs. EF Capacity

It is unclear why FO only interacted with ER/physiological reactivity to influence EF Performance scores but not EF Capacity scores. One possibility is that each FO component may be individually predictive of different EF skills (e.g., working memory, attention shift, inhibitory control). This was demonstrated in previous literature when Pierucci and colleagues (2014) found that FO Entities only predicted inhibitory control scores whereas FO Cognitions only predicted attention shift scores. Given this, the interaction between FO and ER/physiological reactivity on each individual aspect of EF (e.g., working memory, attention shift, inhibitory control), rather than a single composite EF score, may need to be examined in future research. However, this explanation does not account for the fact that I observed significant findings with regard to EF Performance, which is itself a comprehensive measure of EF skills. What we do know is that EF Performance and EF Capacity seem to measure inherently different skills. EF Performance captures the manifestation of EF skills as they occur in everyday life, whereas EF Capacity examines EF skills in a controlled research setting. EF Performance questions were rated by teachers on a three-point scale indicating if there was no evidence of EF skills, there was some evidence of EF skills, or if there was evidence that a child had mastered EF skills. EF Capacity tasks, on the other hand, captured a much wider range of EF potential (e.g., range on the Card Sort task was from 0-25). It is possible that lab-based assessments of EF are more sensitive and thus capture a child's EF skills as they are emerging. However, with the present data, it is unclear whether this accounts for the lack of findings with regard to EF Capacity. Interestingly, EF Performance and EF Capacity were correlated in the present study and had similar distributions, so it is unlikely that these differences were due to ceiling or floor effects on one of these measures of EF. It is clear that this interesting finding needs to be further investigated in future research.

Theoretical Implications

Although previous work has demonstrated that pretend-play positively influences the development of EFs (Carlson et al., 2014; Pierucci et al., 2014; Thibodeau et al., 2016), no studies to date have examined how pretend-play and ER/physiological stress reactivity *interact* to influence EF development. Given the findings of the current study, we have gained important insights into how to potentially facilitate EF skills among children who have poor ER skills and children who have low levels of physiological reactivity (i.e., through fantasy-oriented pretend-play). Although we cannot infer causation with the design of the present, the data obtained are an important first step in examining whether or not pretend-play serves as a protective factor for low-income Head Start children. Most studies examining the influence of pretend-play on development have recruited children from middle-class samples (e.g., Carlson et al., 2014; Pierucci et al., 2014; Thibodeau et al., 2016). The present study is the first to demonstrate positive developmental outcomes associated with a propensity towards imagination and pretend-play in a low-income setting. In the future, this study may stimulate intervention and dissemination research including experimental studies of the effects of pretend-play in Head

Start settings and the development of pretend-play curricula for Head Start classrooms (see Practical Implications section below for more details).

The data from the present study are also in line with what would be predicted by the biological sensitivity to context literature (Boyce, 2007; Boyce & Ellis, 2005; Ellis & Boyce, 2008; Obradovic et al., 2010). Given that my sample was comprised of children in supportive Head Start preschool settings, the biological sensitivity to context literature would predict better outcomes among children with higher levels of physiological reactivity and poorer outcomes among children with low levels of physiological reactivity, due to their overall context alone (Boyce, 2007; Boyce & Ellis, 2005; Ellis & Boyce, 2008; Obradovic et al., 2010). This is indeed what I found (see Figure 6b). However, the difference in cognitive outcomes between children with high vs. low physiological reactivity was minimized when a child's propensity towards pretend-play was taken into account. In other words, pretend-play is perhaps serving as an added protective factor to support the development of skills among children in supportive settings who have low levels of physiological reactivity. In this way, my data extends the biological sensitivity to context literature by suggesting positive environmental experiences like pretend-play may provide an added layer of support in adaptive settings to further facilitate development among children who typically display poorer outcomes. In other words, there may be possible moderators to a child's sensitivity to their context.

This novel addendum to the biological sensitivity to context theory is likely to serve as a catalyst for future studies. For example, it will first be important to replicate the current findings across different stress response systems (e.g., parasympathetic). In addition, the conclusions of the present study are limited in that we cannot definitively determine how "at-risk" the current sample is. In conjunction with evaluating the risk status of children, future studies should also focus on testing this research question across diverse contexts. If the current sample is considered to be in relatively supportive environments as speculated, it will be important to determine if a propensity towards imagination and pretend-play also influences outcomes in high-risk settings. Moving forward, more traditional buffering models should also be examined (e.g., Luthar, 2006; Luthar & Eisenberg, 2017). Specifically, one could examine the effects of cumulative risk (e.g., poverty status, parental stress/depression, threatening life experiences) on EF outcomes across different levels of physiological reactivity and FO. In this way, FO may be considered as a moderator in the interaction between reactivity and context (i.e., moderated-moderation or 3-way interaction).

Practical Implications

In addition to adding to the literature in unique ways, the present study also offers a number of key practical implications. Although some existing school readiness interventions incorporate aspects of pretend-play into their curriculum (e.g., Tools of the Mind; Bodrova & Leong, 2007), conclusions about the specific contributions of pretend-play that can be drawn from these interventions are limited because researchers are unable to separate the effects of pretend-play from the other aspects of the program (e.g., self-regulation and reading). Furthermore, the type of pretend-play encouraged in current school readiness interventions is highly structured and strongly rooted in reality-based pretense (e.g., playing house). For example, children are often assigned a role from which they cannot deviate during the play. This type of structured pretense-based play may not evoke the same cognitive benefits as child-driven fantastical pretend-play (Pierucci et al., 2014; Thibodeau et al., 2016). Interestingly, recent evaluations of current pretend-play-based school readiness interventions indicate that highly structured play curricula are hard to implement, leading to poor implementation fidelity and poor child outcomes (Morris et al., 2014). As mentioned above, there are certain aspects of pretend-play that appear to be necessary for the observed developmental benefits (i.e., child-driven, adult guided, fantastical; Fehr & Russ, 2016; Russ, 2016; Thibodeau et al., 2016; Weisberg, 2016) that are not all emphasized in current pretend-play curricula. In fact, most of the pretend-play that is typically encouraged by current Head Start teachers, such as children playing in the home-living center during center time, lacks these crucial elements.

The present study utilized measures that were sensitive to individual differences in style of imagination and play and thus allowed me to examine what specific aspects of pretend-play may influence child outcomes. In line with current speculations by Russ (2016), Thibodeau and colleagues (2016), and Weisberg (2016), I found that a behavioral aspect of pretend-play may be crucial for children who have a low physiological sensitivity to their context, whereas a cognitive aspect of pretend-play may be crucial for children who have trouble regulating their emotions. These data indicate that in addition to encouraging pretending behaviors in their classroom, preschool teachers should specifically focus on scaffolding *fantastical* pretense in order to facilitate both the behavioral and cognitive aspects of pretend-play that seem to be driving positive developmental outcomes.

Thus these findings have the potential to inform curriculum development that centers around encouraging daily pretend-play. Through previous pretend-play intervention studies in our lab, we have developed a comprehensive 5-week pretend-play program (15-min a day) that can be easily implemented into existing classroom curriculum at little to no cost (Thibodeau et al., 2016). This pretend-play curriculum, which encourages child-driven, teacher guided, fantastical pretend-play, naturally aligns with the goals of many existing preschool curricula, most notably Head Start's Creative Curriculum. Specifically, the play program focuses on encouraging child-initiated, purely imaginative play that does not require any props or materials (e.g., a children's play kitchen).

It should be noted that the present study only included measures of a child's proclivity towards fantasy and imaginative behaviors. However, it is likely that children low in FO are still able to engage in these imaginative behaviors and cognitions, although they may not do it as often or of their own accord as their peers who have a high FO. In fact, our research indicates that all children were able to engage in and benefit from the 5-week play program regardless of their baseline propensity towards pretend-play (Thibodeau et al., 2016). Future intervention research will be needed to test this assumption. It seems that the present study has identified a unique subset of children who might be especially sensitive to this type of intervention (i.e., children with more emotional reactivity and low physiological arousal). This should be further explored moving forward.

Because pretend-play is an enjoyable experience in childhood, creating a curriculum that focuses on scaffolding child-driven, fantastical pretend-play will likely be sustainable and foster positive classroom environments. Our experiences in developing this play program have also highlighted the importance of teacher-guided pretend-play. Although the play should be child-driven, teachers should facilitate engagement in the imagination by asking questions and pretending alongside the children. Therefore, utilizing such a curriculum also has the potential to foster positive student-teacher relationships, thus further promoting teacher and staff buy-in for such a program.

Limitations and Future Directions

Although the present study provides important information to our understanding of how fantasy-oriented pretend-play may be impacting EF skills in a low-income population, it is important to address potential limitations of the current study. First of all, it is important to note that the data presented in the current study only reflect the range of performance in the particular sample of children studied. Due to the lack of standardized normative values for ER measures, it is unclear whether or not the low, medium, and high levels of ER presented in the results reflect what is typically seen among children of this age. Furthermore, behavior considered “normal” may differ among typically developing children and children in a Head Start setting. It is possible that children in Head Start settings are generally more dysregulated than their same-age peers and thus would have overall lower scores on measures of ER skills. However, when Head Start teachers are rating children’s emotion regulation skills, they are rating each child in comparison to other children in their classroom. Therefore, a child who would typically be considered to have poor ER skills may be rated on the high end of ER if they are in a classroom full of other children who demonstrate more extreme levels of dysregulation. Until work has been done to replicate the findings of the present study and establish standardized norms for ER skills in a Head Start population, the generalizability of these findings should be viewed with caution. Along the same lines, we cannot make clear conclusions about the stability of the findings of the present study due to the presence of small cell sizes (see Appendix F and G), further highlighting the need for replication. Finally, future replication studies should consider issues such as family-wise error or common methods variance, as these could potentially attenuate the results of the present study.

Despite these limitations, the findings of the current study are theoretically novel and are an important first step in examining whether or not pretend-play can serve as a protective factor to enhance development in a Head Start setting. Given this, it will be valuable to continue investigating the research questions of the present study in future research. In addition to the ideas for future research mentioned throughout the previous sections, the design of the current study could be enhanced by testing the interrelationships between EF, ER, physiological reactivity, and FO longitudinally. As it stands, I am unable to make conclusions about which skills might be necessary precursors to others. By testing EF, ER, physiological reactivity, and FO across several time points, we will not only gain a clearer understanding of the directionality of the relationship between ER and EF, but we will also gain greater insight into exactly how FO may be influencing these interrelated skills. Moving forward, associations among these skills should also be assessed across different contexts. The data of the present study suggest that FO, or having a high propensity towards fantastical cognitions and behaviors, impacts development in a preschool setting. It should be investigated whether the effects of FO extend to the home environment as well. Thus data should be gathered from multiple informants (i.e., teachers and parents). Along the same lines, the methods of the present study could be strengthened by including more observational models of propensity towards pretend-play. Assessing children's orientation towards imaginative thoughts and behaviors via self-report is an important first step in investigating the influence of pretend-play on development, but it would also be interesting to explore the impact of pretend-play as it manifests and naturally occurs in a preschool setting. Doing so would allow us to consider possible developmental benefits associated with the *extent* to which children engage in pretend behaviors and cognitions. Finally, the findings of the present study should be extended to include more distal measures of school readiness (i.e., children's grades and behavior in kindergarten) to determine whether pretend-play also serves as a protective factor to minimize deficits in school readiness observed among low-income children (Hope & Bierman, 1998; Rimm-Kaufman et al., 2000).

General Conclusions

In conclusion, a growing body of evidence indicates the importance of certain abilities (i.e., emotion regulation, appropriate physiological reactivity, executive functions) for the development of school readiness skills, especially among children raised in low-income environments (Bierman et al., 2008; Blair & Razza, 2007; Domitrovich et al., 1999; Passolunghi et al., 2006; Welsh et al., 2011). Although many preschool curricula have been developed to help scaffold school readiness skills among low-income preschoolers (e.g., Promoting Alternative THinking Strategies, Tools of the Mind), these curricula are often very costly and require extensive training to implement. Furthermore, the complexity of these programs often places additional burdens on the preschool teachers, leading to poor implementation fidelity (Weiland & Yoshikawa, 2013). In order to improve upon the sustainability of these programs, it is important to identify natural environmental experiences that are implicated in normative development. The present research suggests that a propensity towards fantastical pretend-play, a ubiquitous natural environmental experience in childhood, serves as a protective factor to enhance EF outcomes among Head Start children with poor ER skills and low physiological reactivity. Specifically, data from the current study indicate that in addition to encouraging pretending behaviors in their classroom, preschool teachers should specifically focus on scaffolding *fantastical* pretense in order to facilitate both the behavioral and cognitive aspects of pretend-play that seem to be driving positive developmental outcomes. Because fantastical pretend-play is easily implemented into existing classroom curricula at little to no cost, the findings from the present study could have even broader impacts on curriculum development, especially in low-income populations such as Head Start. Children who are well prepared for school are much more likely to be occupationally successful. Indeed, a conservative estimate for the return on investment for preparing children for school is 7:1 based on several longitudinal school-readiness interventions such as the Chicago and High/Scope Perry Preschool Projects (Bruner, 2004). Thus, the findings from the present study have the potential to inform Head Start researchers, practitioners, and policy makers on how pretend-play can be used as an additional, cost-effective method to facilitate school readiness among Head Start preschool children, and will likely spur future intervention research.

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APPENDIX A

Imaginative Play Predisposition Interview (Singer & Singer, 1981)

"Let me ask you a few questions about yourself."

"What's your favorite game?" **(Ask for clarification if necessary)**

"What's your favorite toy?" **(Ask for clarification if necessary)**

"What's your favorite story?" **(Ask for clarification if necessary)**

"What's your favorite TV show?" **(Ask for clarification if necessary)**

"What do you like to do when you are by yourself?" **(Ask for clarification if necessary)**

"What do you like to do with you are with other kids?" **(Ask for clarification if necessary – e.g., "What kind of play?")**

"What do you think about just before you go to sleep?"

Do you like to talk to yourself when you are in bed at night?

YES **NO**

APPENDIX B

Imaginary Companion and Impersonation Interview (Taylor & Carlson, 1997)
“Now I’m going to ask you some questions about friends. Some friends are real like the kids at school, the ones you play with. And some friends are not real friends. Pretend friends are ones that are make-believe, that you pretend are real. Do you have a pretend friend?"

YES **NO**

(IF YES)
What’s your friend’s name?____________________
Is X a toy, a friend at school, or totally pretend?____________________
Is X a boy or a girl? **(if not clear from name)**____________________
How old is X?____________________
What does he/she look like?____________________
What do you like about X?____________________
What do you not like about X?____________________
Where does X live?____________________
Where does s/he sleep?____________________

“Let’s talk some more about pretending things.”

“Do you ever pretend to be an animal?”

YES **NO**

(If yes) “Which animal(s)?”

____

“Do you ever pretend to be a different person?”

YES **NO**

(If yes) “What person do you pretend to be?”

____

“Have you ever pretended to be anything else, like a machine, a plane, or something like that?”

YES **NO**

(If yes) “What sort of thing did you pretend to be?”

____

APPENDIX C

Fantasy Orientation Questionnaire (Gilpin, 2009)

We're interested in finding out more about this child's interests and environment, specifically pertaining to his or her interest in imagination. Your responses will help us account for the differences between children so that each child is seen as an individual. Please be as specific and detailed as you wish.

	Believes Is Real	**Belief Unknown**	**Believes Is Pretend**
1. Santa Claus	1	2	3
2. Easter Bunny	1	2	3
3. Tooth Fairy	1	2	3
4. Fairies	1	2	3
5. Witches	1	2	3
6. Ghosts	1	2	3
7. Dragons	1	2	3

8. Please list the television shows, video games, and books that this child enjoys and sees often.

____

9. What games does this child most enjoy playing? (For example, "Chutes and Ladders," playing trucks/dinosaurs, pretending to be a mommy)

____

10. How would you rate this child's level of fantasy orientation? (i.e., does this child do a lot of pretending, have great interest in fantastical beings, watch television programs and read books that are fantasy oriented?)

- 1 Child strongly interested in reality (e.g., play sports)
- 2 Sometimes child is interested in fantasy, but mostly interested in reality
- 3 Child equally interested in fantastical and reality play/media
- 4 Child is mostly interested in fantasy, but sometimes interested in reality
- 5 Child is strongly interested in fantasy (e.g., often engages in pretense, enjoys fantastical books, etc.)

APPENDIX D

Teacher Imagination Questionnaire (Gilpin et al., *in preparation*)
1 = Never; 2 = Rarely; 3 = Occasionally; 4 = Frequently; 5 = Almost Every Day

1. Do (did) you ever observe this child interacting with an imaginary friend?
2. How often does this child reenact story lines (without veering from the story)?
3. How often does this child expand upon a story line, or involve those characters in their own imagination?
4. To what extent does this child engage in pretend interactions with invisible characters when playing alone?
5. How often does this child come up with a play script on their own ("Let's pretend to be…")?
6. How often does this child talk about pretend entities like Santa Claus, fairies, dragons, etc.?
7. How often does this child engage in pretend play (role play, imaginative play) in the classroom during free-play time?
8. How often does this child engage in pretend play on the playground?
9. Does this child ever talk to him/herself (e.g., during quiet time, during solitary play)?
10. How often is this child's pretend play reality based (pretend to be mommy, pretend to be fire-fighter, pretend to talk on the phone, etc.)?
11. How often is this child's pretend play imaginative (pretend to be princesses, superheroes, pretend to fly, etc.)?
12. How often does this child use props or articles of clothing to enhance their pretend play?
13. When given a choice, how often does this child self-select realistic toys, books, games or media (doctor/dentist, trucks, animals)?
14. Does this child ever impersonate another character from a book, TV show, etc.?
15. When this child plays with other children, to what extent does the play involve interactions with invisible imaginary others?
16. Does this child ever seem to interact with characters from books or TV shows during their pretend play?
17. How often does this child try to engage their peers in their reality based, non-imaginative play?
18. How often does this child talk about their dreams?
19. When given a choice, how often does this child self-select fantastical toys, books, games or media (Dr. Seuss, Disney Princesses, Superheroes, etc.)?
20. How often does this child involve imaginary (invisible) props in their play (e.g., imaginary phone, sword, horse, toy)?
21. How often does this child try to engage their peers in their imaginative play?
22. How often do you encourage imaginative play in your classroom?

APPENDIX E

FO Components
Factor Loadings in Parentheses

<u>FO Entities</u>:
<u>Fantasy Orientation Questionnaire</u>

1. Belief in Santa Claus (.44) **- Removed due to group differences**
2. Belief in Easter Bunny (.66) - **Removed due to group differences**
3. Belief in Tooth Fairy (.60) **- Removed due to group differences**
4. Belief in Fairies (.63)
5. Belief in Witches (.66)
6. Belief in Ghosts (.75)
7. Belief in Dragons (.70)

<u>FO Preferences</u>:
<u>Imaginative Play Predisposition Interview</u>

2. “What’s your favorite toy?” (.56)
3. “What’s your favorite story?” (.42)
4. “What’s your favorite TV show?” (.59)
5. “What do you like to do when you are by yourself?” (.45)

<u>Fantasy Orientation Questionnaire</u>

9. “What games does this child most enjoy playing? (For example, “Chutes and Ladders,” playing trucks/dinosaurs, pretending to be a mommy)” (.42) **- Removed due to group differences**
10. “How would you rate this child’s level of fantasy orientation? (i.e., Does this child do a lot of pretending, have great interest in fantastical beings, watch television programs and read books that are fantasy oriented?)” (.49)

<u>FO Pretense</u>:
<u>Imaginary Companion and Impersonation Interview</u>

2. “Do you ever pretend to be an animal?” (.40)
3. “Do you ever pretend to be a different person?” (.63)
4. “Have you ever pretended to be anything else, like a machine, a plane, or something like that?” (.66)

FO Experience:

Teacher Imagination Questionnaire

2. “How often does this child reenact story lines (without veering from the story)?” (.67)
3. “How often does this child expand upon a story line, or involve those characters in their own imagination?” (.62)
5. “How often does this child come up with a play script on their own (“Let’s pretend to be…”)?” (.76)
6. “How often does this child talk about pretend entities like Santa Claus, fairies, dragons, etc.?” (.59)
7. “How often does this child engage in pretend play (role play, imaginative play) in the classroom during free-play time?” (.74)
8. “How often does this child engage in pretend play on the playground?” (.77)
10. “How often is this child’s pretend play reality based (pretend to be mommy, pretend to be fire-fighter, pretend to talk on the phone, etc.)?” (.70)
11. “How often is this child’s pretend play imaginative (pretend to be princesses, superheroes, pretend to fly, etc.)?” (.73)
12. “How often does this child use props or articles of clothing to enhance their pretend play?” (.73)
13. “When given a choice, how often does this child self-select realistic toys, books, games or media (doctor/dentist, trucks, animals)?” (.59)
14. “Does this child ever impersonate another character from a book, TV show, etc.?” (.63)
16. “Does this child ever seem to interact with characters from books or TV shows during their pretend play?” (.55)
17. “How often does this child try to engage their peers in their reality based, non-imaginative play?” (.59)
18. “How often does this child talk about their dreams?” (.52)
19. “When given a choice, how often does this child self-select fantastical toys, books, games or media (Dr. Seuss, Disney Princesses, Superheroes, etc.)?” (.75)
20. “How often does this child involve imaginary (invisible) props in their play (e.g., imaginary phone, sword, horse, toy)?” (.69)
21. “How often does this child try to engage their peers in their imaginative play?” (.73)
22. “How often do you encourage imaginative play in your classroom?” (.53)

FO Imaginary Companion:

Teacher Imagination Questionnaire

1. Do (did) you ever observe this child interacting with an imaginary friend? (.67)
4. To what extent does this child engage in pretend interactions with invisible characters when playing alone? (.62)
9. Does this child ever talk to him/herself (e.g., during quiet time, during solitary play)? (.51)
15. Does this child ever impersonate another character from a book, TV show, etc.? (.67)

APPENDIX F

Table 20

Participant Distribtion across ER and FO Entities Levels.

	FO Entities Low	FO Entities Medium	FO Entities High	Total
ER Low	5	25	2	32
ER Medium	21	90	20	131
ER High	6	19	2	27
Total	32	134	24	190

APPENDIX G

Table 21

Participant Distribtion across SCL Reactivity and FO Pretense Levels.

	FO Pretense Low	FO Pretense Medium	FO Pretense High	Total
SCL Reactivity Low	2	3	6	11
SCL Reactivity Medium	10	8	16	34
SCL Reactivity High	2	4	1	7
Total	14	15	23	52

APPENDIX H

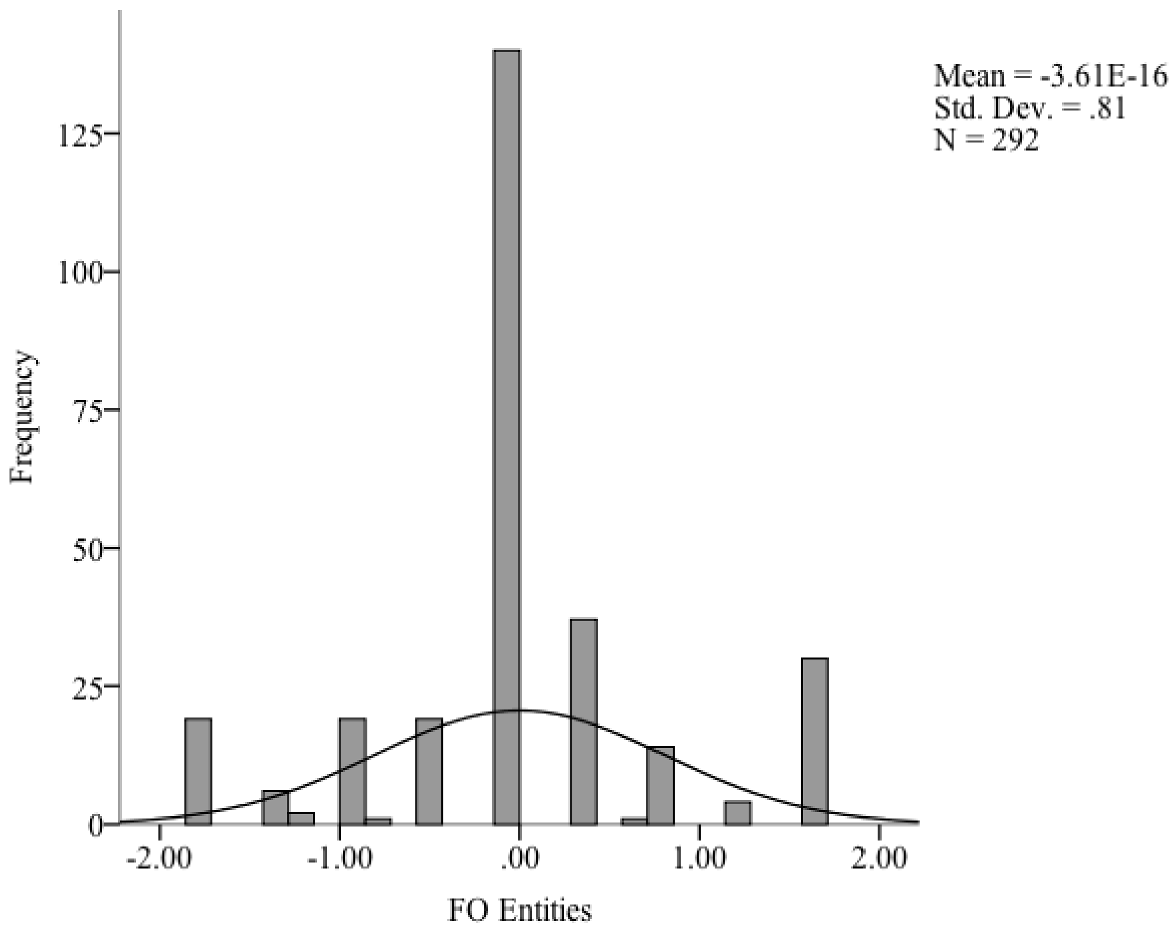

Figure 8. FO Entities score distribution. Data are normally distributed.

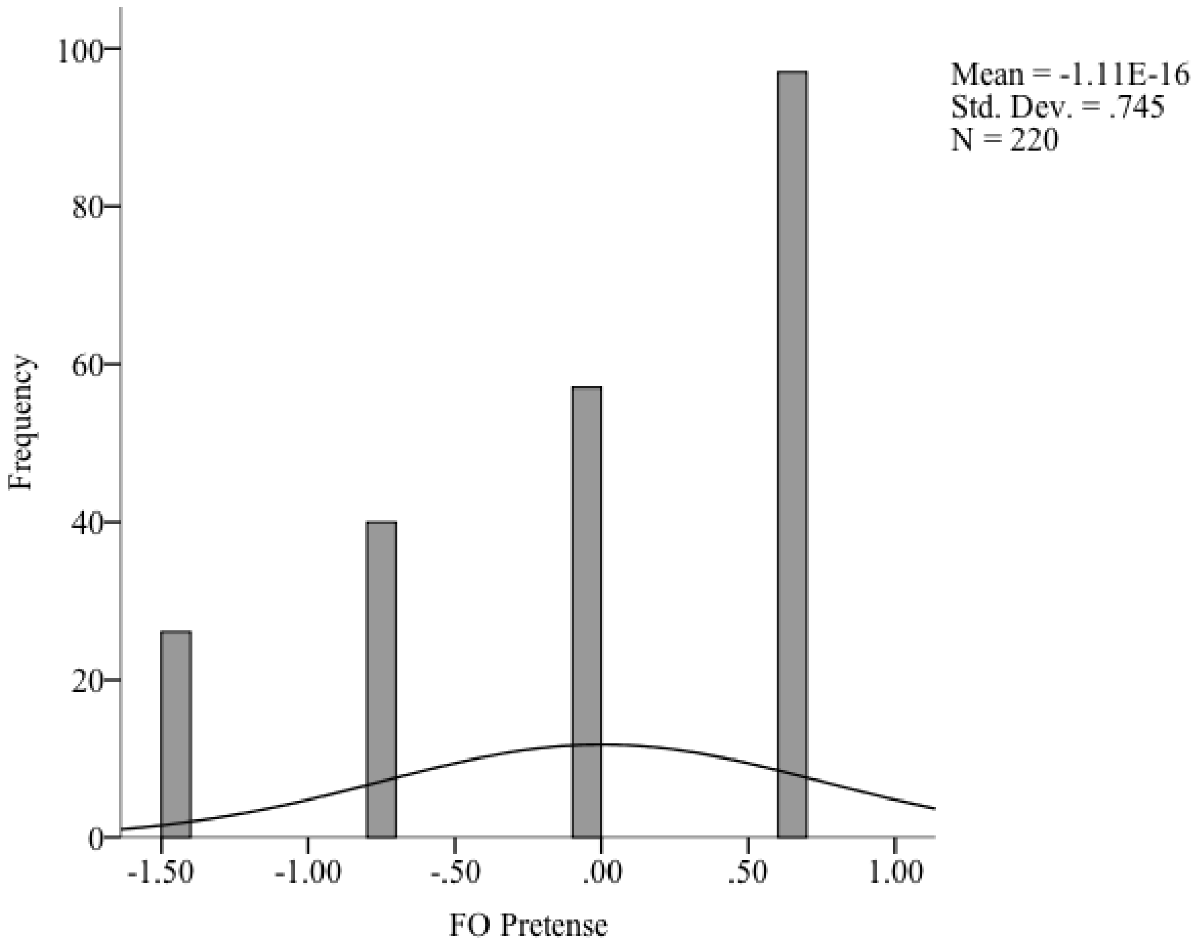

Figure 9. FO Pretense score distribution. Data are moderately negatively skewed.

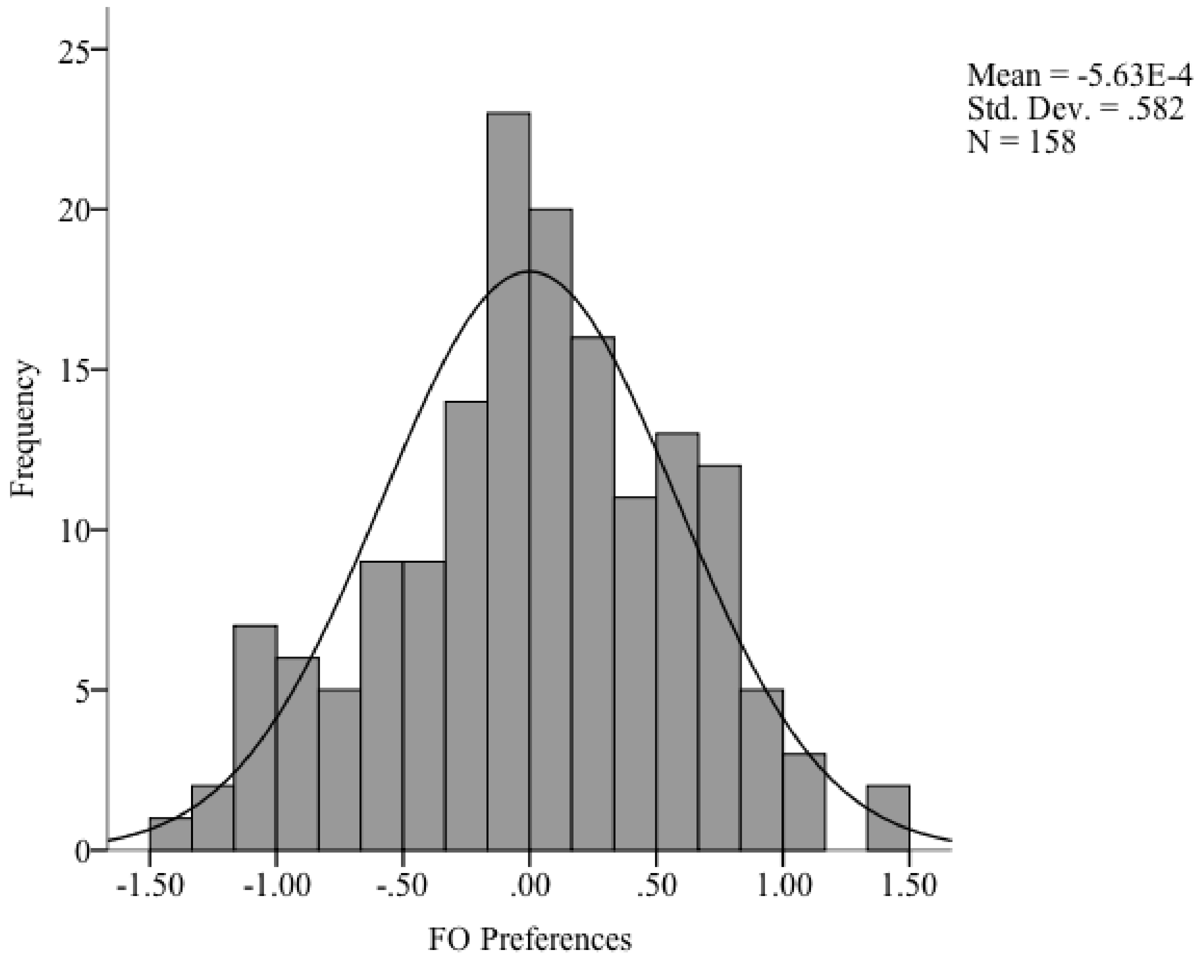

Figure 10. FO Preferences score distribution. Data are normally distributed.

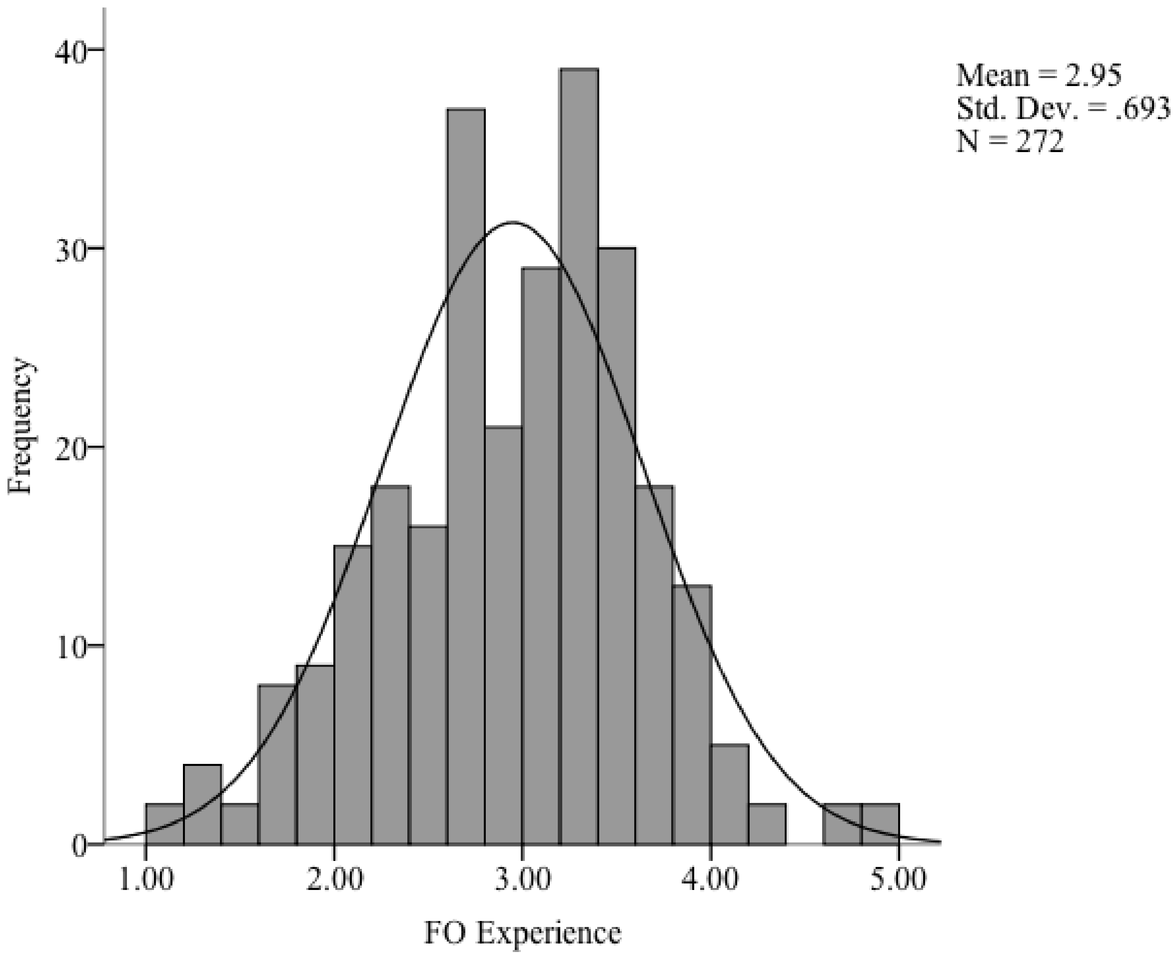

Figure 11. FO Experience score distribution. Data are normally distributed.

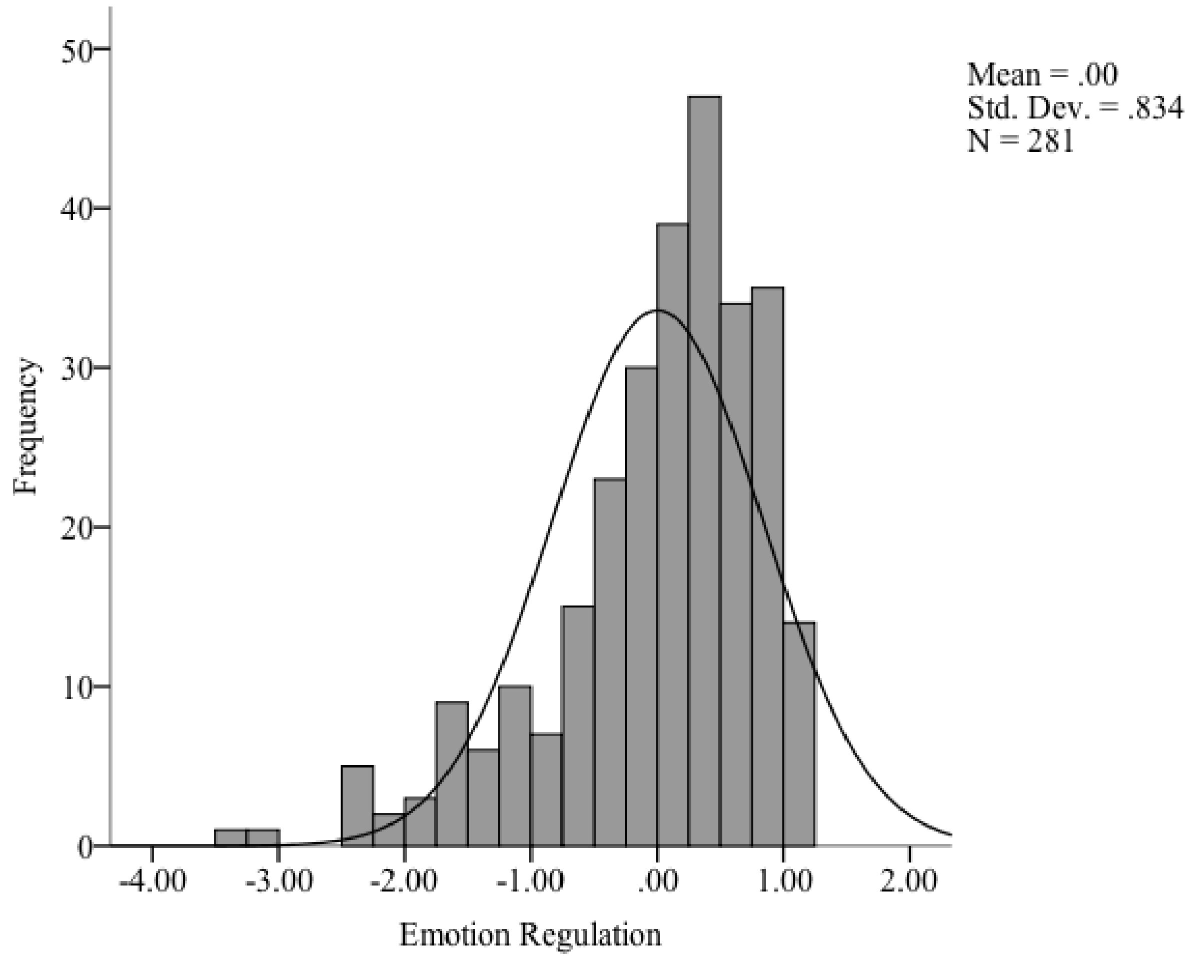

Figure 12. Emotion Regulation score distribution. Data are negatively skewed.

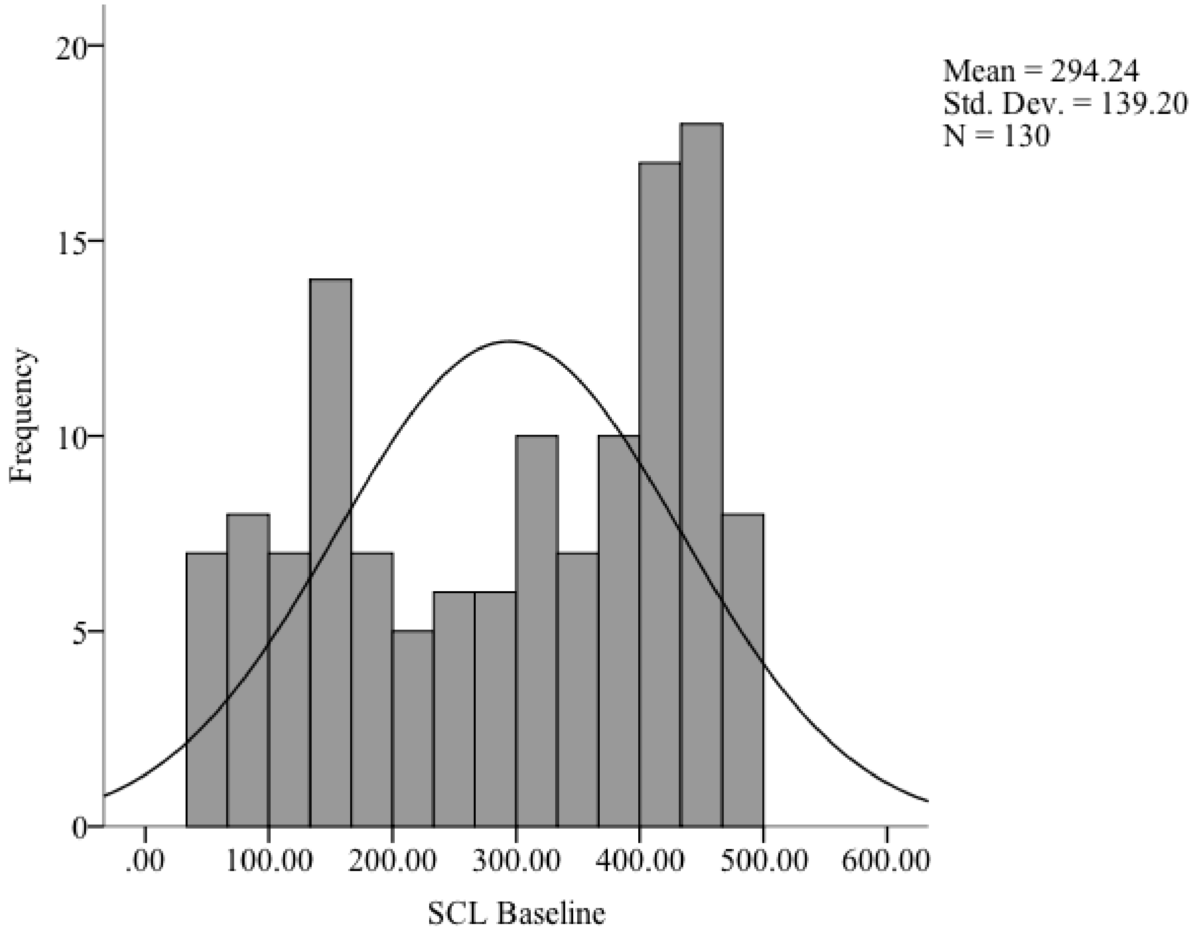

Figure 13. SCL baseline score distribution. Data are normally distributed.

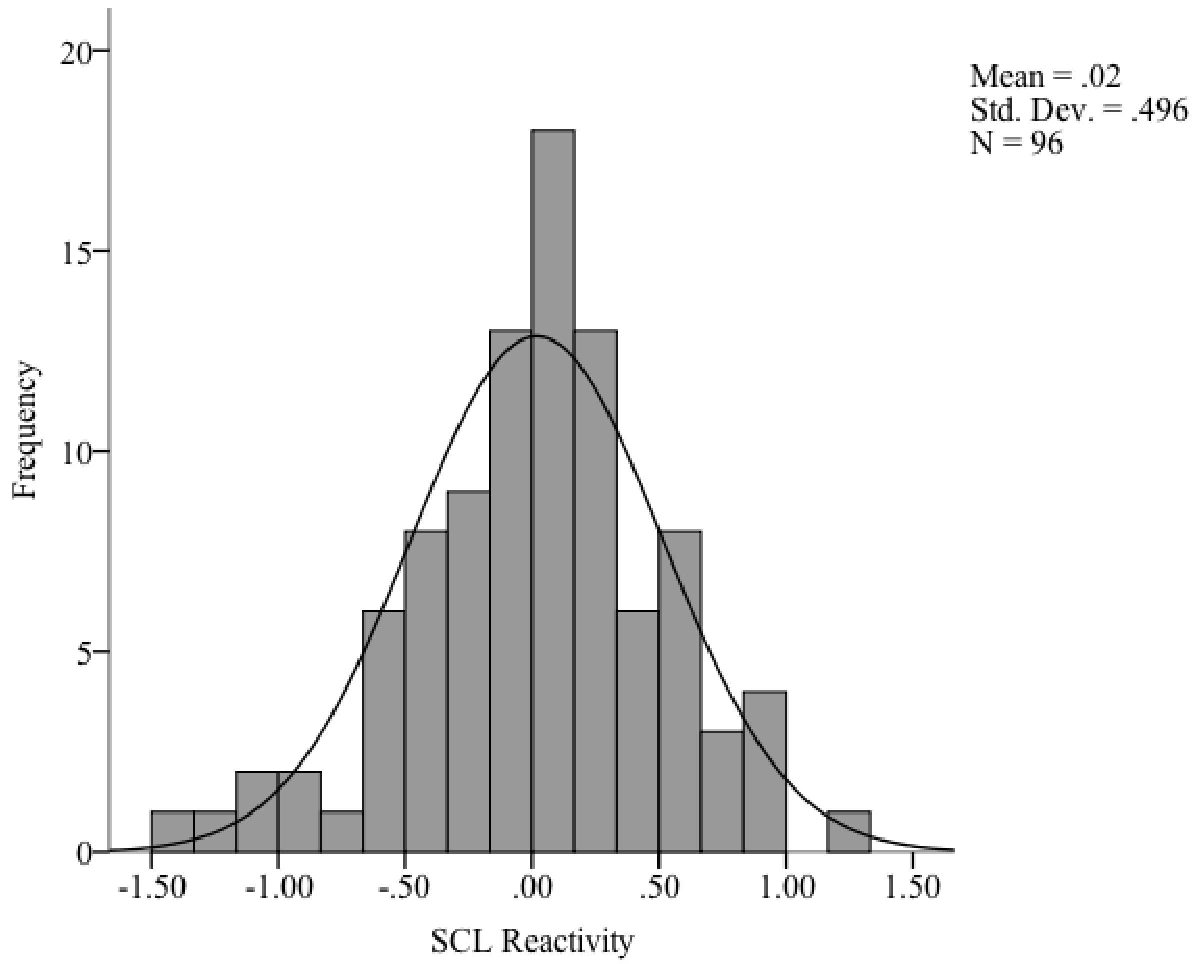

Figure 14. SCL Reactivity score distribution. Data are normally distributed.

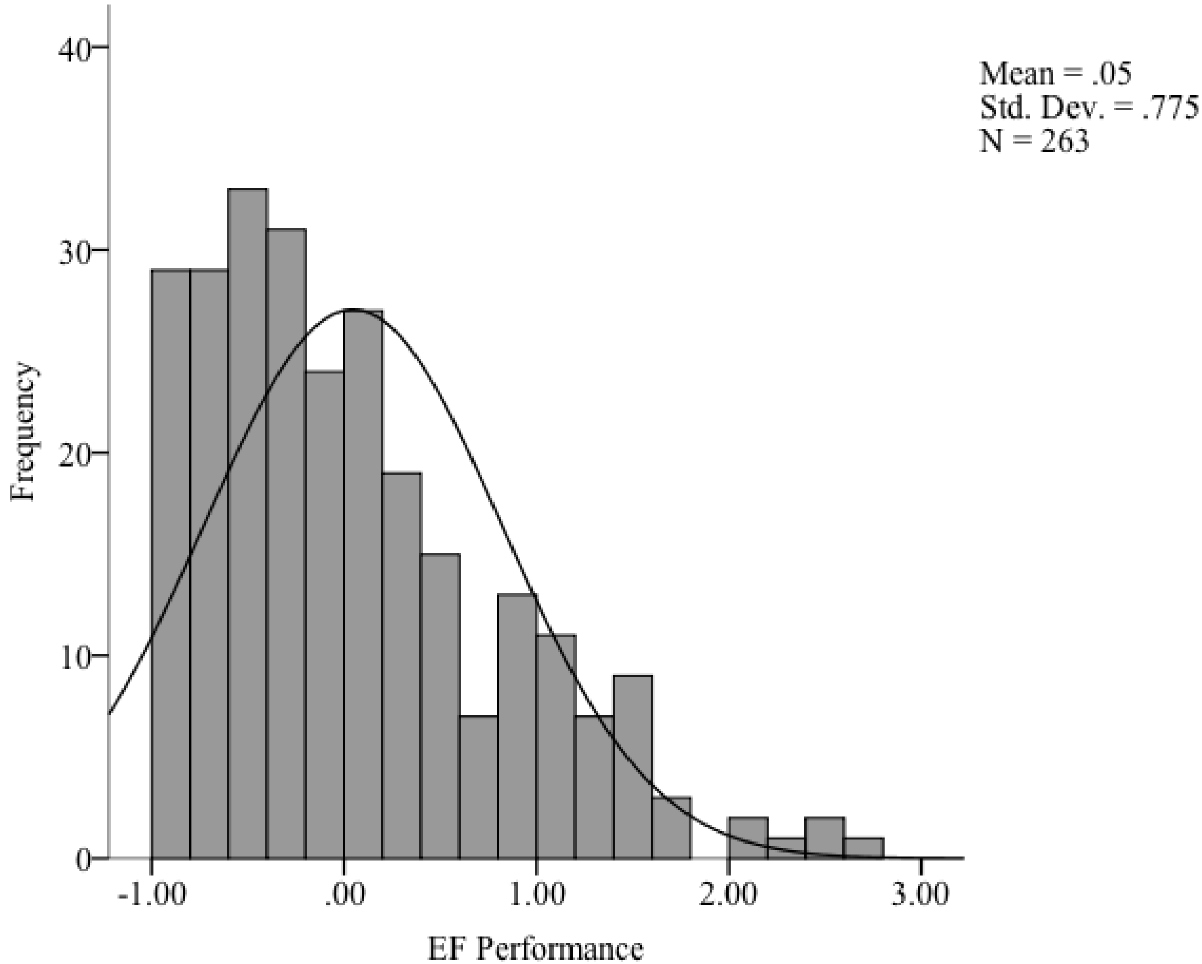

Figure 15. EF Performance score distribution. Higher scores on EF Performance indicate poorer EF outcomes. Data are moderately positively skewed.

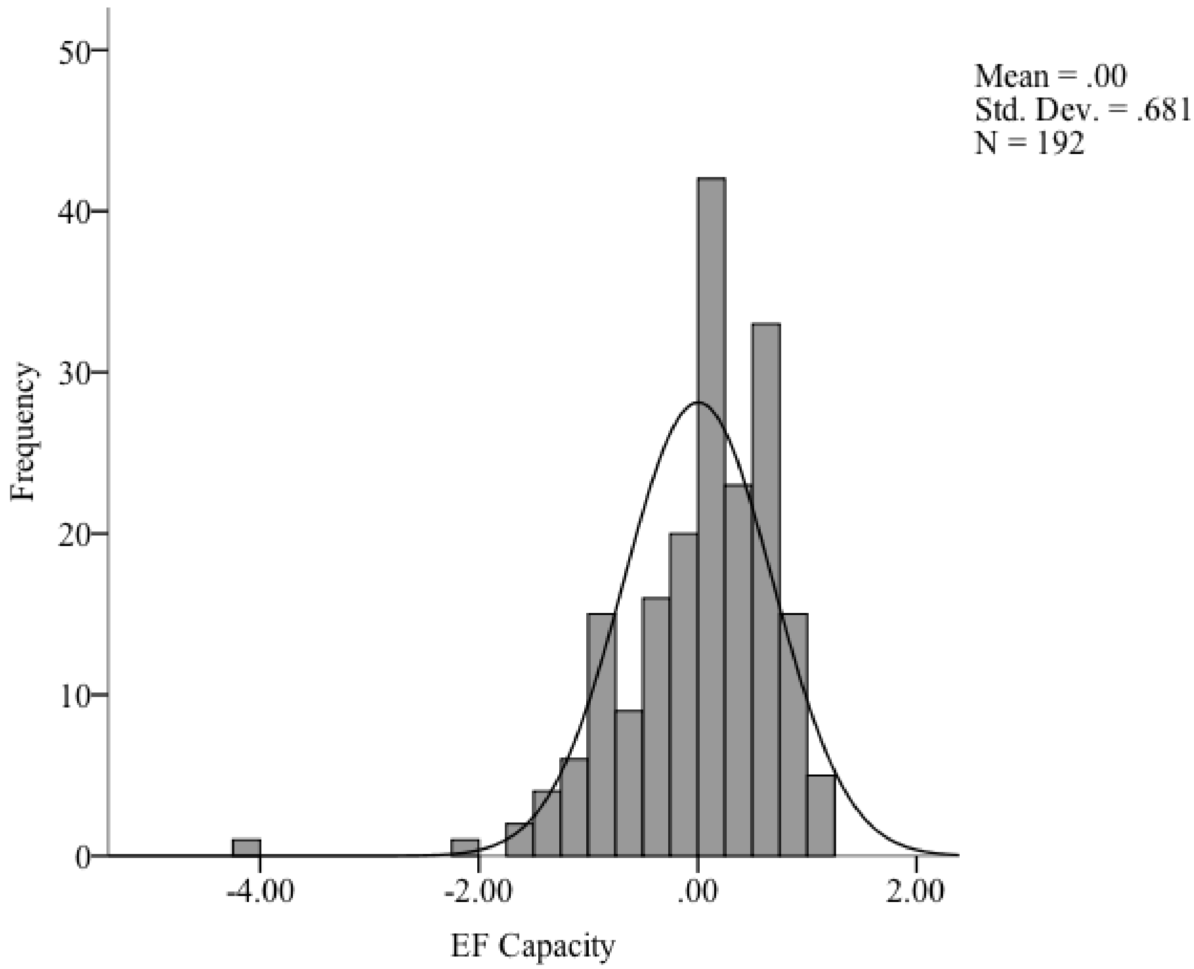

Figure 16. EF Capacity score distribution. Data are negatively skewed and positively kurtotic.

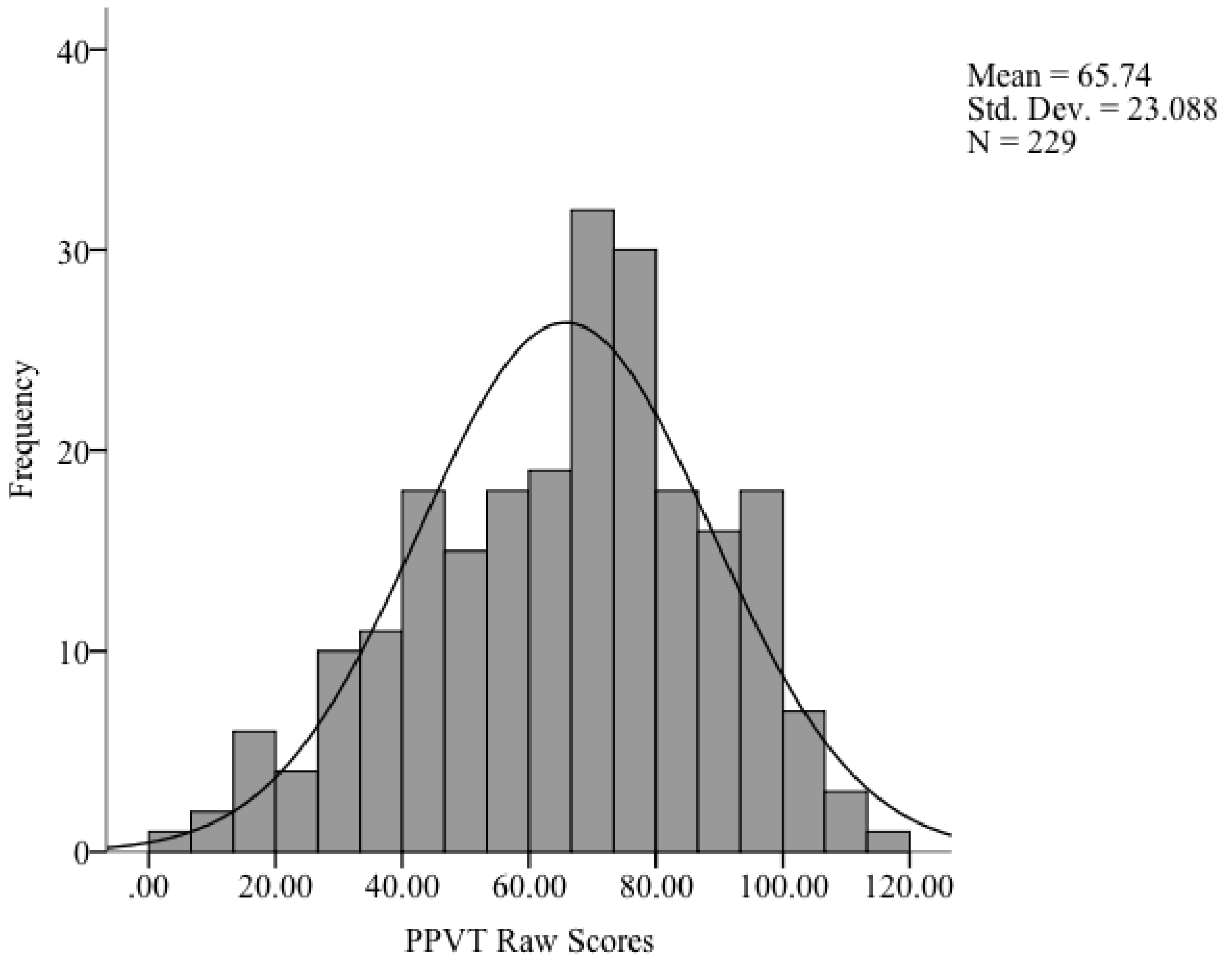

Figure 17. PPVT raw score distribution. Data are normally distributed.

APPENDIX I

Table 22

Hierarchical Linear Regression Analysis for ERxFO Preferences on EF Performance.

Dependent Variable: EF Performance						
Model	Predictor	B	*SE* B	*t*	*p*	ΔR^2
1	Constant	1.74	1.01	1.72	.09	.08*
	Age	-.36	.25	-1.46	.15	
	Gender	.29	.13	2.27	.03*	
	PPVT Raw	-.01	.00	-1.59	.11	
2	Constant	.72	.78	.92	.36	.39**
	Age	-.16	.19	-.84	.40	
	Gender	.17	.10	1.67	.10	
	PPVT Raw	-.00	.00	-.75	.45	
	ER	-.54	.06	-9.32	.00**	
	FO Preferences	-.02	.09	-.17	.86	
3	Constant	.68	.78	.87	.39	.00
	Age	-.14	.19	-.74	.46	
	Gender	.18	.10	1.76	.08	
	PPVT Raw	-.00	.00	-.92	.36	
	ER	-.55	.06	-9.31	.00**	
	FO Preferences	-.02	.09	-.26	.80	
	ERxFO Preferences	.10	.11	-.91	.36	

Note. Higher scores on EF Performance indicate poorer ER outcomes. *$p \leq .05$; ** $p \leq .01$.

Table 23

Hierarchical Linear Regression Analysis for ERxFO Pretense on EF Performance.

Dependent Variable: EF Performance						
Model	Predictor	B	*SE* B	*t*	*p*	ΔR^2
1	Constant	1.84	.80	2.30	.02*	.10**
	Age	-.33	.20	-1.67	.10	
	Gender	.24	.12	2.08	.04*	
	PPVT Raw	-.01	.00	-2.91	.00**	
2	Constant	1.02	.61	1.68	.10	.40**
	Age	-.21	.15	-1.36	.18	
	Gender	.10	.09	1.12	.26	
	PPVT Raw	-.00	.00	-.08	.16	
	ER	-.59	.05	-11.37	.00**	
	FO Pretense	-.00	.06	-.06	.95	
3	Constant	1.00	.61	1.62	.11	.00
	Age	-.19	.15	-1.29	.20	
	Gender	.10	.09	1.08	.28	
	PPVT Raw	-.00	.00	-1.43	.15	
	ER	-.59	.05	-11.34	.00**	
	FO Pretense	-.01	.06	-.11	.91	
	ERxFO Pretense	.06	.07	-.86	.39	

Note. Higher scores on EF Performance indicate poorer EF outcomes. *$p \leq .05$; ** $p \leq .01$.

Table 24

Hierarchical Linear Regression Analysis for ERxFO Experience on EF Performance.

Dependent Variable: EF Performance						
Model	Predictor	B	*SE* B	*t*	*p*	ΔR^2
1	Constant	1.70	.78	2.17	.03*	.01**
	Age	-.31	.19	-1.60	.11	
	Gender	.14	.12	1.21	.23	
	PPVT Raw	-.01	.00	-2.63	.01**	
2	Constant	.70	.59	1.18	.24	.42**
	Age	-.11	.15	-.74	.46	
	Gender	.03	.09	.35	.73	
	PPVT Raw	-.00	.00	-1.38	.17	
	ER	-.58	.05	-11.69	.00**	
	FO Experience	-.03	.07	-.40	.69	
3	Constant	.64	.60	1.07	.29	.00
	Age	-.09	.15	-.57	.57	
	Gender	.02	.09	.25	.80	
	PPVT Raw	-.00	.00	-1.43	.15	
	ER	-.41	.26	-1.58	.12	
	FO Experience	-.03	.07	-.45	.65	
	ERxFO Experience	.06	.09	.67	.50	

Note. Higher scores on EF Performance indicate poorer EF outcomes. *$p \leq .05$; ** $p \leq .01$.

Table 25

Hierarchical Linear Regression Analysis for ERxFO Entities on EF Capacity.

Dependent Variable: EF Capacity						
Model	Predictor	B	*SE* B	*t*	*p*	ΔR^2
1	Constant	-.57	.65	-.89	.38	.19**
	Age	-.04	.16	-.24	.81	
	Gender	-.12	.10	-1.21	.23	
	PPVT Raw	.01	.00	5.40	.00**	
2	Constant	-.42	.65	-.65	.52	.02
	Age	-.07	.16	-.42	.68	
	Gender	-.09	.10	-.88	.39	
	PPVT Raw	.01	.00	5.03	.00**	
	ER	.12	.06	2.00	.05*	
	FO Entities	-.01	.06	-.11	.91	
3	Constant	-.40	.66	-.61	.54	.00
	Age	-.07	.16	-.44	.66	
	Gender	-.09	.10	-.90	.37	
	PPVT Raw	.01	.00	5.00	.00**	
	ER	.12	.06	1.90	.06	
	FO Entities	-.01	.06	-.11	.91	
	ERxFO Entities	-.01	.08	-.18	.85	

Note. *$p \leq .05$; ** $p \leq .01$.

Table 26

Hierarchical Linear Regression Analysis for ERxFO Preferences on EF Capacity.

Dependent Variable: EF Capacity

Model	Predictor	B	*SE* B	*t*	*p*	ΔR^2
1	Constant	-1.21	.91	-1.32	.19	.18**
	Age	.13	.23	.58	.56	
	Gender	-.13	.12	-1.10	.27	
	PPVT Raw	.01	.00	3.94	.00**	
2	Constant	-1.09	.92	-1.18	.24	.02
	Age	.12	.23	.54	.59	
	Gender	-.10	.12	-.83	.41	
	PPVT Raw	.01	.00	3.41	.00**	
	ER	.10	.08	1.38	.17	
	FO Preferences	.05	.11	.46	.65	
3	Constant	-1.07	.92	-1.16	.25	.00
	Age	.11	.23	.49	.63	
	Gender	-.11	.12	-.92	.36	
	PPVT Raw	.01	.00	3.43	.00**	
	ER	.11	.08	1.43	.16	
	FO Preferences	.06	.11	.56	.58	
	ERxFO Preferences	.07	.13	.56	.57	

Note. ** $p \leq .01$.

Table 27

Hierarchical Linear Regression Analysis for ERxFO Pretense on EF Capacity.

Dependent Variable: EF Capacity						
Model	Predictor	B	*SE* B	*t*	*p*	ΔR^2
1	Constant	-.51	.70	-.72	.47	.15**
	Age	-.03	.18	-.19	.85	
	Gender	-.11	.10	-1.09	.28	
	PPVT Raw	.01	.00	4.27	.00**	
2	Constant	-.42	.71	-.59	.56	.02
	Age	-.05	.18	-.26	.79	
	Gender	-.07	.10	-.72	.47	
	PPVT Raw	.01	.00	3.91	.00**	
	ER	.10	.07	1.54	.13	
	FO Pretense	-.02	.07	-.34	.73	
3	Constant	-.46	.71	-.65	.52	.01
	Age	-.04	.18	-.21	.84	
	Gender	-.07	.10	-.71	.48	
	PPVT Raw	.01	.00	3.88	.00**	
	ER	.11	.07	1.63	.11	
	FO Pretense	-.02	.07	-.35	.73	
	ERxFO Pretense	-.08	.09	-.93	.35	

Note. ** $p \leq .01$.

Table 28

Hierarchical Linear Regression Analysis for ERxFO Experience on EF Capacity.

Dependent Variable: EF Capacity						
Model	Predictor	B	*SE* B	*t*	*p*	ΔR^2
1	Constant	-.73	.68	-1.07	.29	.17**
	Age	.01	.17	.06	.95	
	Gender	-.08	.10	-.78	.44	
	PPVT Raw	.01	.00	4.92	.00**	
2	Constant	-.70	.69	-1.02	.31	.02
	Age	-.05	.17	-.27	.79	
	Gender	-.05	.10	-.51	.61	
	PPVT Raw	.01	.00	4.68	.00**	
	ER	.09	.06	1.46	.15	
	FO Experience	.08	.09	.93	.36	
3	Constant	-.66	.70	-.93	.35	.00
	Age	-.06	.18	-.34	.73	
	Gender	-.05	.10	-.47	.64	
	PPVT Raw	.01	.00	4.68	.00**	
	ER	-.02	.35	-.06	.95	
	FO Experience	.08	.09	.95	.34	
	ERxFO Experience	.04	.12	.33	.74	

Note. ** $p \leq .01$.

Table 29

Hierarchical Linear Regression Analysis for SCLxFO Entities on EF Performance.

Dependent Variable: EF Performance						
Model	Predictor	B	*SE* B	*t*	*p*	ΔR^2
1	Constant	1.63	1.14	1.43	.16	.10
	Age	-.37	.28	-1.32	.19	
	Gender	.31	.22	1.42	.16	
	PPVT Raw	-.00	.01	-.15	.88	
	SCL Baseline	-.00	.00	-1.08	.29	
2	Constant	1.58	1.16	1.36	.18	.01
	Age	-.36	.29	-1.26	.22	
	Gender	.32	.22	1.43	.16	
	PPVT Raw	-.00	.01	-.14	.89	
	SCL Baseline	-.00	.00	-1.00	.33	
	SCL Reactivity	-.03	.22	-.14	.89	
	FO Entities	.08	.13	.60	.55	
3	Constant	1.57	1.17	1.34	.19	.00
	Age	-.35	.29	-1.21	.23	
	Gender	.30	.23	1.30	.20	
	PPVT Raw	-.00	.01	-.18	.86	
	SCL Baseline	-.00	.00	-.98	.33	
	SCL Reactivity	-.03	.22	-.15	.89	
	FO Entities	.06	.15	.40	.69	
	SCL Reactivity x FO Entities	.10	.29	.34	.73	

Note. Higher scores on EF Performance indicate poorer EF outcomes.

Table 30

Hierarchical Linear Regression Analysis for SCLxFO Preferences on EF Performance.

Dependent Variable: EF Performance						
Model	Predictor	B	*SE* B	*t*	*p*	ΔR^2
1	Constant	1.01	2.14	.47	.64	.05
	Age	-.22	.50	-.45	.66	
	Gender	.18	.29	.62	.54	
	PPVT Raw	.00	.01	.38	.71	
	SCL Baseline	-.00	.00	-1.00	.33	
2	Constant	1.11	2.24	.50	.62	.00
	Age	-.25	.52	-.48	.64	
	Gender	.21	.31	.67	.51	
	PPVT Raw	.00	.01	.33	.74	
	SCL Baseline	-.00	.00	-.85	.40	
	SCL Reactivity	-.05	.29	-.14	.89	
	FO Preferences	-.08	.28	-.28	.78	
3	Constant	1.08	2.28	.48	.64	.01
	Age	-.23	.53	-.43	.67	
	Gender	.20	.32	.62	.54	
	PPVT Raw	.00	.01	.25	.80	
	SCL Baseline	-.00	.00	-.77	.45	
	SCL Reactivity	.05	.38	.14	.89	
	FO Preferences	-.12	.30	-.39	.70	
	SCL Reactivity x FO Preferences	-.23	.58	-.39	.70	

Note. Higher scores on EF Performance indicate poorer EF outcomes.

Table 31

Hierarchical Linear Regression Analysis for SCLxFO Experience on EF Performance.

Dependent Variable: EF Performance						
Model	Predictor	B	*SE* B	*t*	*p*	ΔR^2
1	Constant	1.52	1.21	1.26	.21	.06
	Age	-.37	.30	-1.22	.23	
	Gender	.25	.23	1.07	.29	
	PPVT Raw	-.00	.01	-.13	.90	
	SCL Baseline	-.00	.00	-.67	.50	
2	Constant	1.91	1.27	1.50	.14	.02
	Age	-.34	.31	-1.10	.28	
	Gender	.27	.24	1.12	.27	
	PPVT Raw	.00	.01	.24	.81	
	SCL Baseline	-.00	.00	-.80	.43	
	SCL Reactivity	.03	.23	.13	.90	
	FO Experience	-.20	.19	-1.07	.29	
3	Constant	2.04	1.42	1.44	.16	.00
	Age	-.37	.34	-1.08	.29	
	Gender	.28	.25	1.13	.27	
	PPVT Raw	.00	.01	.30	.77	
	SCL Baseline	-.00	.00	-.79	.43	
	SCL Reactivity	-.29	1.43	-.20	.84	
	FO Experience	-.22	.20	-1.07	.29	
	SCL Reactivity x FO Experience	.11	.47	.23	.82	

Note. Higher scores on EF Performance indicate poorer EF outcomes.

Table 32

Hierarchical Linear Regression Analysis for SCLxFO Entities on EF Capacity.

Dependent Variable: EF Capacity						
Model	Predictor	B	*SE* B	*t*	*p*	ΔR^2
1	Constant	-1.59	1.02	-1.55	.13	.21*
	Age	.28	.25	1.14	.26	
	Gender	-.28	.21	-1.35	.19	
	PPVT Raw	.01	.01	1.89	.07	
	SCL Baseline	.00	.00	.24	.81	
2	Constant	-1.58	1.00	-1.58	.12	.08
	Age	.29	.24	1.18	.25	
	Gender	-.29	.20	-1.42	.16	
	PPVT Raw	.01	.01	1.70	.10	
	SCL Baseline	.00	.00	.42	.68	
	SCL Reactivity	.15	.18	.85	.40	
	FO Entities	-.22	.11	-1.92	.06	
3	Constant	-1.59	1.00	-1.58	.12	.01
	Age	.30	.25	1.24	.22	
	Gender	-.33	.21	-1.56	.13	
	PPVT Raw	.01	.00	1.54	.13	
	SCL Baseline	.00	.00	.38	.71	
	SCL Reactivity	.15	.18	.85	.40	
	FO Entities	-.25	.12	-2.06	.05*	
	SCL Reactivity x FO Entities	.19	.24	.79	.44	

Note. $*p \leq .05$.

Table 33

Hierarchical Linear Regression Analysis for SCLxFO Preferences on EF Capacity.

Dependent Variable: EF Capacity						
Model	Predictor	B	*SE* B	*t*	*p*	ΔR^2
1	Constant	-2.66	1.88	-1.42	.17	.16
	Age	.63	.41	1.52	.14	
	Gender	-.30	.28	-1.05	.30	
	PPVT Raw	.00	.01	.49	.63	
	SCL Baseline	.00	.00	.15	.88	
2	Constant	2.87	1.98	-1.45	.16	.03
	Age	.69	.44	1.59	.13	
	Gender	-.33	.29	-1.12	.28	
	PPVT Raw	.00	.01	.28	.78	
	SCL Baseline	.00	.00	.18	.86	
	SCL Reactivity	.08	.25	.33	.75	
	FO Preferences	.16	.26	.64	.53	
3	Constant	-2.86	2.00	-1.43	.17	.02
	Age	.67	.44	1.51	.15	
	Gender	-.31	.30	-1.04	.31	
	PPVT Raw	.00	.01	.43	.67	
	SCL Baseline	.00	.00	.00	1.00	
	SCL Reactivity	-.01	.29	-.02	.98	
	FO Preferences	.18	.26	.68	.50	
	SCL Reactivity x FO Preferences	.32	.50	.65	.53	

Table 34

Hierarchical Linear Regression Analysis for SCLxFO Pretense on EF Capacity.

Dependent Variable: EF Capacity						
Model	Predictor	B	*SE* B	*t*	*p*	ΔR^2
1	Constant	-2.09	1.17	-1.78	.08	.17
	Age	.45	.28	1.63	.11	
	Gender	-.31	.20	-1.54	.13	
	PPVT Raw	.01	.01	1.03	.31	
	SCL Baseline	.00	.00	.23	.82	
2	Constant	-1.73	1.19	-1.46	.15	.08
	Age	.39	.28	1.38	.18	
	Gender	-.30	.20	-1.50	.15	
	PPVT Raw	.00	.01	.47	.64	
	SCL Baseline	.00	.00	.52	.61	
	SCL Reactivity	.24	.18	1.31	.20	
	FO Pretense	-.18	.14	-1.30	.20	
3	Constant	-1.72	1.20	-1.43	.16	.00
	Age	.38	.28	1.35	.19	
	Gender	-.30	.21	-1.44	.16	
	PPVT Raw	.00	.01	.52	.61	
	SCL Baseline	.00	.00	.40	.69	
	SCL Reactivity	.25	.19	1.33	.19	
	FO Pretense	-.18	.14	-1.27	.21	
	SCL Reactivity x FO Pretense	-.10	.28	-.36	.72	

Table 35

Hierarchical Linear Regression Analysis for SCLxFO Experience on EF Capacity.

Dependent Variable: EF Capacity						
Model	Predictor	B	*SE* B	*t*	*p*	ΔR^2
1	Constant	-1.67	1.10	-1.52	.14	.20
	Age	.30	.27	1.09	.28	
	Gender	-.26	.23	-1.16	.26	
	PPVT Raw	.01	.01	1.84	.07	
	SCL Baseline	.00	.00	.29	.77	
2	Constant	-1.81	1.16	-1.57	.13	.01
	Age	.32	.28	1.14	.26	
	Gender	-.27	.23	-1.17	.25	
	PPVT Raw	.01	.01	1.70	.10	
	SCL Baseline	.00	.00	.21	.84	
	SCL Reactivity	.15	.19	.78	.44	
	FO Experience	.02	.17	.12	.90	
3	Constant	-1.61	1.32	-1.22	.23	.00
	Age	.27	.32	.87	.39	
	Gender	-.25	.24	-1.01	.32	
	PPVT Raw	.01	.01	1.72	.09	
	SCL Baseline	.00	.00	.25	.80	
	SCL Reactivity	-.30	1.32	-.23	.82	
	FO Experience	-.00	.18	-.00	1.00	
	SCL Reactivity x FO Experience	.15	.44	.35	.73	

APPENDIX J

THE UNIVERSITY OF ALABAMA | Office of the Vice President for Research & Economic Development
Office for Research Compliance

October 26, 2016

Ansley Gilpin, PhD
Department of Psychology
College of Arts & Sciences
Box#: 870348

Re: IRB Protocol 13-022-R3 "Improving School Readiness: Social, Cognitive, and Physiological Predictors in Preschool"

Dear Dr. Gilpin:

The University of Alabama Non-Medical IRB recently met to consider your renewal application. The IRB voted to approve your protocol for a one year period.

Your application will expire on October 20, 2017. If your research will continue beyond this date, complete the renewal portions of the IRB Renewal Application. If you need to modify the study, please submit the Modification of an Approved Protocol Form. **Changes in this study cannot be initiated without IRB approval, except when necessary to eliminate apparent immediate hazards to participants.** When the study closes, please complete the Request for Study Closure.

Please use reproductions of the IRB approved stamped consent/assent forms to obtain consent from your participants.

Should you need to submit any further correspondence regarding this application, please include the above application number.

Good luck with your research.

Sincerely,

Stuart Usdan, PhD
Chair, Non-Medical Institutional Review Board

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