THE RELATIONSHIP BETWEEN

EXECUTIVE FUNCTIONS AND

FANTASY ORIENTATION

by

JILLIAN MICHELLE PIERUCCI

ANSLEY T. GILPIN, COMMITTEE CHAIR
FRANCES A. CONNERS
JASON SCOFIELD

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ABSTRACT

This study explored whether there were developmental benefits to being fantasy-oriented. Past research reveals that around 3 years old, children begin to develop executive functions, such as attentional shift, working memory, cognitive inhibitory control, and behavioral inhibitory control. Simultaneously, children develop an understanding of the difference between fantasy and reality, with some children developing a strong preference towards fantastical play and thinking. One hundred and six preschoolers were given a battery of executive function and fantasy orientation measures during two interviews with an experimenter, in addition to collecting parent and teacher questionnaires. The relationship between children's executive function performance and fantasy orientation development was examined to explore if any developmental benefits exist with being fantasy-oriented. Results suggested that there might be *specific* developmental benefits to being a high fantasy-oriented child, such as better behavioral inhibition skills and working memory.

DEDICATION

This thesis is dedicated to all who helped guide and encourage me through this process. From my sensational advisor, Ansley Tullos Gilpin, to my exceptional committee members: Dr. Fran Conners and Dr. Jason Scofield, my encouraging family, friends, and fellow graduate students, and each committed research assistant in the KID lab, I could not have done it without all of you. I thank you immensely for encouraging me to seek God, while pursing my dreams and living for a greater purpose in life!

LIST OF ABBREVIATIONS AND SYMBOLS

β   Beta: Probability of producing a false-negative error; Type II error

F   Fisher's *F* ratio: A ration of two variances

M   Mean: The sum of a set of items divided by the number of items within the set

n   Sample size of group

p   Probability: Chance of occurrence under the null hypothesis of a value more extreme than the observed value

r   Pearson's *r*: Value of correlation

SD   Standard Deviation: Value of variation from the mean

t   Value of *t* test

<   Less than

=   Equal to

ACKNOWLEDGMENTS

CONTENTS

LIST OF TABLES

INTRODUCTION

The Relationship between Executive Functions and Fantasy Orientation

Historically, children who were highly imaginative and engaged in fantastical play were perceived as being at risk for developing mental disorders, such as schizophrenia (Sperling, 1954; Svendsen, 1934; Vostrovsky, 1895). Several cultures and religious groups, such as the Mennonites, still discourage children's pretend play because they perceive it to be a sign of possession. However, more recently imaginary companions and pretend play have been accepted as normal facets of children's development (McLewin & Muller, 2006; Taylor, 1999; Woolley & Tullos, 2008). Research has discovered individual differences in children's engagement in fantasy, including children creating imaginary companions and engaging in pretend play. Some children are more reality focused, engaging in more realistic based play and not creating imaginary companions, whereas other children are more fantastical, engaging often in pretend play and creating imaginary companions. These fantasy-oriented activities, such as pretend play, naturally require the use of developmental skills, such as executive functions, to navigate between fantasy and reality realms. When engaging in pretense, children use executive functions, such as behavioral inhibition, to suppress a behavioral response. For example, when children are pretending that a banana is a telephone, they must inhibit eating it. Children also use cognitive inhibition to suppress a thought and replace it with an alternative, such as imagining their bedroom as a tree house in the rainforest. Attentional shift is necessary to switch back and forth between the fantasy and reality realms. Additionally, working memory allows children to remember which realm they are playing in and recall play scripts. Researchers have speculated

1

that there is a developmental advantage to being a high fantasy-oriented child (Sharon &

Woolley, 2004; Taylor & Carlson, 1997), but to date no research has investigated this claim. In

this introduction, research on executive functions will be reviewed first, followed by the research

on fantasy orientation.

Executive Functions

Executive functioning (EF) alludes to higher order, cognitive processes that assist in

recognition and control of an individual's thoughts and actions (Carlson, 2005; Reed, Pien, &

Rothbart, 1984). Executive functions are controlled by the prefrontal cortex and are instrumental

in facilitating goal setting, self-planning, working memory, attention, and inhibition, which may

be the most essential cognitive attainment in early childhood (Bialystok & Craik, 2010). There

are various tasks that measure executive functions. Performance on these tasks are good

indicators of an individual's general level of cognitive ability. Additionally, performances on

executive function tasks have been linked to the development of many higher-order cognitive

functions, such as planning and setting goals.

Inhibitory Control. Inhibitory control is one of the executive functions and is defined as

an individual's ability to stop or prevent an automatic, prepotent response and initiate an

alternative response (Stroop, 1935; Wright, Waterman, Prescott, & Murdoch-Eaton, 2003).

Prepotent responses are responses or actions that are well learned by an individual, have been

solidly reinforced, and are automatically retrieved. Inhibitory control develops via maturation of

the prefrontal cortex in childhood, and can be observed and measured as early as 3 ½-years-old.

Although inhibitory control continues to develop throughout childhood, the majority of its

development occurs by age 6 (Diamond & Taylor, 1996). Studies have examined how

individuals respond to situations that contradict an individual's automatic response by inventing

tasks that challenge an individual's inhibitory control (Archibald & Kerns, 1999; Diamond & Taylor, 1996; Gerstadt, Hong, & Diamond, 1994; Kochanska, Murray, Jacques, Koenig, & Vandegeest, 1996; Olson, 1989; Reed, Pien, & Rothbart, 1984; Stroop, 1935; Wright, Waterman, Prescott, & Murdoch-Eaton, 2003). Approximately twenty inhibitory control tasks were designed for children and normed by researchers over the past two decades. Of these, two studies stand out as the most influential for current investigations of inhibitory control development.

Diamond and Taylor (1996) has been one of the most cited studies because it identified the developmental window for inhibitory control in typically developing children. In this study, Diamond and Taylor sampled 160 children from 3 ½-years-old to 7–years-old using the "day-night" conflict task. In this task, children were presented with two cards: (1) the sun, which depicted the 'day' and (2) the moon and stars, which depicted the 'night'. Children were told to respond opposite of what the cards depicted (e.g., say 'day' when presented with the moon and stars card that depicted the night). They found that although inhibitory control continues developing throughout childhood, children's inhibitory control develops most significantly between ages 3 ½ to 6. Additional studies have corroborated this developmental window (Gerstadt, Hong, & Diamond, 1994; Reed, Pien, & Rothbart, 1984; Wright et al., 2003). A second study that was instrumental in defining inhibitory control development was Olson (1989). Olson gave 79 preschoolers a full battery of inhibitory control tasks to determine whether or not inhibitory control is a single developmental construct. Using Principal Components Analysis, Olson found that the tasks loaded onto multiple constructs and thus concluded that inhibitory control is not one unified construct, but rather a subset of skills that develop during childhood. Measures of inhibitory control evaluate two main types of inhibition: (1) behavioral inhibition and (2) cognitive inhibition. Additionally, inhibitory control tasks differ as to whether they only

ask children to *delay* an automatic response, or whether they present a *conflict* that requires both a delay and a subsequent alternate action.

Behavioral Inhibitory Control. Behavioral inhibitory control captures an individual's ability to stop a prepotent behavioral response (Kochanska, Murray, Jacques, Koenig, & Vandegeest, 1996). Researchers have created various tasks that measure behavioral inhibitory control, including the "candy task", in which children are asked to hold candy on their tongue and inhibit eating it until the experimenter gives them permission. Another measure is the Gift task, in which the experimenter noisily wraps a gift for them while children face away and attempt to inhibit the desire to peek.

As previously mentioned, inhibitory control is measured through two types of tasks, delay and conflict. In behavioral delay tasks (e.g., Gift and candy task), individuals must delay their self-gratification. These tasks do not require as much inhibitory control compared to conflict tasks because they do not cause a conflict between individuals' prepotent responses and alternate responses. In conflict tasks, individuals must suppress an automatic response and replace it with an alternative response. For example, in the game "bear/dragon", which is similar to the popular children's game "Simon Says", children are told to mind the nice bear and do the actions he says to do, but to not mind the mean dragon (Kochanska et al., 1996; Reed et al., 1984). Thus in this game, children not only have to suppress their prepotent behavior (as in delay tasks), but they also have to replace their automatic response with an alternate one (e.g., suppressing what the mean dragon said to do and replacing it with what the nice bear told them to do last.)

Cognitive Inhibitory Control. Cognitive inhibitory control is defined as the ability to inhibit automatic, internal cognitions, such as thoughts and memories, in order to focus on an

4

alternative cognition. One of the most prevalent cognitive inhibitory control tasks for adults is the Stroop task (Stroop, 1935). In the Stroop task, participants are asked to state the ink color of the written or typed word, rather than read the word. Reading is an automatic process for literate individuals, and the Stroop task measures inhibition by asking participants to suppress reading and alternatively name the ink color. Although this task is a good measure of cognitive inhibition in adults, it is not developmentally appropriate for young children because children's reading skills are still emerging. Thus reading has not become an automated response. Developmental researchers have attempted to create tasks that adequately measure inhibitory control and are comparable to the adult Stroop task, such as the "Fruit Stroop" task (Archibald & Kerns, 1999) and the "Day-Night task" (Gerstadt, Hong & Diamond, 1994), but it is difficult to create a task that only measures inhibitory control (disparate from other skills, such as working memory) and one that requires children to inhibit a true prepotent response.

To date, the best developmental conflict, cognitive inhibitory control task that mirrors the adult Stroop task was designed by Wright et al. (2003). This task does not demand reading skills to be mastered nor overload working memory, yet still requires participants to inhibit a true automatic response. Wright et al.'s "Animal-Stroop" task is a valid and reliable measure of cognitive inhibitory control that has been normed on typically developing children and special populations ages 3-16 (mental age). In this task, participants are presented with drawings of animals, some of which have mismatched heads and bodies (e.g., a duck head on a cow body). Children are instructed to name the animal by the body, rather than the face (naming an entity by its face is a prepotent response; see Johnson, 1993). Both response times and number of errors are recorded to measure cognitive inhibitory control.

Wright et al. (2003) examined cognitive inhibitory control using 155 children from 3- to 16-years-old. Results indicated that participants had more errors and slower response times for stroop trials (e.g., mismatched images) than matching trials (e.g., matched images), and younger children made more errors and had slower response times than older children. Additionally, these findings corroborated Diamond and Taylor's (1996) findings, which suggested that the most significant development of inhibitory control occurs between ages 3-½ to 6-years-old.

Working Memory. Working memory is an individual's temporary mental storage that allows one to manipulate information to process arduous cognitive tasks (Baddeley, 1992). There are various tasks that measure working memory, such as Forward Digit Span (FDS) and Backward Digit Span (BDS) (Halford, Maybery, & Bain, 1988). In both tasks, individuals hear the digits read aloud and are asked to repeat the digits forward (FDS) or backward (BDS).

Davis and Pratt (1996) examined the influence of working memory on the development of theory of mind. Theory of mind refers to an individual's ability to reason about mental states of their own and others (Carlson, 2005). Researchers have found significant relationships between the development of theory of mind and the development of fantasy understanding, although it is unclear which facilitates the other's development or whether there are additional factors, such as working memory, that spur the development of both (Taylor & Carlson, 1997). Fifty-four preschool aged children participated in the Forward Digit Span task and Backward Digit Span task. They found that preschoolers were more successful at the Forward Digit Span task than the Backward Digit Span task because the Forward Digit Span task requires less working memory to recall the digits. Many participants encountered difficulty recalling the digits backwards during the Backward Digit Span task because working memory is more heavily taxed when having to both recall the digits and repeat the digits backward compared to just recalling

the digits (FDS). Overall, Davis and Pratt found that when age and verbal skills were controlled, the Backward Digit Span task significantly predicted theory of mind performance.

Attentional Shift. Attentional shift is an individual's ability to manage attention sources and shift attention from one dimension to another dimension. There are various tasks that measure attentional shift, such as the Standard Dimensional Change Card Sort task (Standard DCCS, Frye, Zelazo, & Palfai, 1995; Zelazo et al., 2003). In this task participants are presented with two small boxes labeled with two different target images (e.g., a blue boat and a red rabbit) and cards of the target images (e.g., blue/red boats and rabbits). The experimenter tells the participant they are going to play two games, the shape game and the color game. The experimenter explains the rules to the first game (e.g., the shape game). After the participant performs five consecutive card sorts correctly during the first game, the experimenter announces they are going to stop playing the shape game and now play the color game. The experimenter explains the rules to the second game (e.g., the color game). The second game of the Standard DCCS task ends when the participant correctly sorts five consecutive cards, with the dependent measure being how many cards the participant sorted incorrectly before sorting 5 correctly. The purpose of the Standard DCCS is to examine how participants perform (e.g., sorting cards) after switching their attention to a new game (post-switch) and managing a new set of rules.

Frye, Zelazo, and Palfai (1995) used the Standard DCCS to examine the relationship between theory of mind and rule-based reasoning in preschoolers. Sixty preschool aged children participated in the Standard DCCS and the Sally-Anne task (theory of mind task). They found that preschoolers who had better-developed attentional shift also demonstrated an earlier development of theory of mind.

Fantasy Orientation

Fantasy orientation is a term that describes an individual's tendency to think and play in a fantastical realm (Sharon & Woolley, 2004; Singer & Singer, 1990; Taylor, 1999; Taylor, Cartwright, & Carlson, 1993). Fantasy orientation seems to be an individual difference which is stable throughout childhood and even into adulthood. For example, children who are high in fantasy orientation tend to have careers that require more creativity as adults, such as theater, art, and writing. Additionally during childhood, children who are high in fantasy orientation often have imaginary companions, engage in pretend play, and explain their world through fantastical entities, such as referring to their bedroom as a superhero's haven or a fairy's castle. Measures of fantasy orientation assess children's creation of imaginary companion(s), tendency to engage in pretend play, and involvement of fantastical entities in their world (Taylor, 1999). Researchers begin measuring fantasy orientation as early as 3-years-old because it has been established that children are capable of understanding the concept of fantasy as early as age 3 (Estes, Wellman, & Woolley, 1989; Sharon & Woolley, 2004; Wellman & Estes, 1986; Woolley & Wellman, 1990). Although no research has yet been done to assess whether there is a developmental advantage to being fantastically oriented, researchers have speculated that children who have high fantasy orientation make distinctions between fantasy and reality more easily, possibly because they have more practice in switching back and forth between fantasy and reality (Golumb & Kuersten, 1996; Sharon & Woolley, 2004; Singer & Singer, 1981).

Imaginative Play. There are great individual differences in children's level of fantasy orientation that can be observed in their play. Children who are low in fantasy orientation often use real items in their play, such as building towers with blocks and playing board games, whereas children who score high on fantasy orientation measures often involve imaginary

companions and fantastical story lines in their imaginative play. Taylor and Howell (1973; as cited in Taylor, Cartwright, & Carlson, 1993) suggested that there are two aspects of fantasy in children's play that can be assessed with fantasy orientation measures: one that involves children's tendency to create an imaginary world and the other that involves children's ability to distinguish fantasy and reality.

Taylor and Carlson (1997) examined fantasy orientation in 152 preschoolers. To assess children's level of fantasy orientation, they used two tasks: 1) Taylor and Carlson's Imaginary Companion and Impersonation Interview and 2) Singer and Singer's Imaginative Play and Predisposition Interview (Singer & Singer, 1981; 1990). Taylor and Carlson's (1997) Imaginary Companion and Impersonation Interview asked children to describe their imaginary companion(s) if they had any and to describe their impersonating behaviors, such as pretending to be an animal, a machine, or an entity besides themselves. Children's engagement in these types of impersonations is a common attribution of pretend play, which some researchers have suggested contributes to children's creation of imaginary companions (Ames & Learned, 1946; Partington & Grant, 1984). During Singer and Singer's Imaginative Play and Predisposition (IPP) Interview, children were asked about their favorite game(s) and toy(s) and to describe their thoughts and imaginations before bedtime. Previous literature used Singer and Singer's IPP Interview to better categorize children into high and low fantasy groups. Using these two fantasy orientation interviews, Taylor and Carlson (1997) assessed children's levels of fantasy orientation (low, moderate, and high). They found that one-third of preschoolers can be classified as high fantasy-oriented.

Imaginary Companions. Imaginary companions are invisible characters that are played with for periods of time over several months, that have a name, and that seem realistic to

children (Svendsen, 1934; Taylor, 1999; Taylor, Cartwright, & Carlson, 1993). Imaginary companions (IC) play a role in children's fantasy lives and are seen as products of children's imaginations (Taylor, Cartwright, & Carlson, 1993). They are a unique imagination because children perceive them as occupying a physical space, as real people do, rather than solely being a mental experience. For example, children will often insist that their imaginary companions have their seats belted around their seat in the car or a place set for them at the dinner table. Yet they are not hallucinations; children are aware that they are only figments of their imagination. Research portrays imaginary companions as a positive influence in children's lives. Taylor, Cartwright, and Carlson (1993) found that children who have imaginary companions are more likely to engage in free-play and fantasy than their peers without imaginary companions. Children who have imaginary companions display more sociability, play more happily, have more (real) friends, cooperate better with peers and adults, and are less timid (Mauro, 1991; Singer & Singer, 1990). Additionally, children with imaginary companions were found to be more easily involved in fantasy and had a stronger tendency to spontaneously participate in fantasy. Although researchers' estimates of the rate of children who have imaginary companions are quite varied, Taylor (1999) reported a conservative estimate of 28% based on both child self-report and parent-corroborated reports.

Purpose of the current study

This study investigated whether there was any developmental benefit to being high fantasy-oriented by determining whether children's level of fantasy orientation was related to their developing executive functions. For example, high fantasy-oriented children would have more opportunities to practice executive functions, thereby display better performance on the executive function tasks. Children with high fantasy orientation might develop better control of

executive functions because they switch between fantasy and reality realms so often (Estes, Wellman, & Woolley, 1989; Golumb & Kuersten, 1996; Morison & Gardner, 1978; Woolley & Wellman, 1990; Woolley & Wellman, 1993). For example, children who are engaging in pretend play have to switch out of the fantasy realm into reality when their play is interrupted. When they switch between realms, they have to use cognitive inhibition to inhibit using pretend play scripts in real life, such as at home with their siblings or at school with their peers. Children also use behavioral inhibition to suppress actions used during pretense compared to reality settings, such as Nagera's (1969) suggestions that children consult their imaginary companions in order to better control their behavior and impulses in real life settings. Children also have to shift their attention between the pretend play partner and the interrupter. Additionally, the have to use working memory to recall and follow the rules of pretend play verses rules in real life.

Other constructs have recently been linked to improved executive function development, such as bilingualism. For example, research in bilingual development has shown that bilingual children, compared to monolingual children, have advanced conflict inhibitory control skills (Bialystok & Craik, 2010; Carlson & Melzoff, 2008) and better attentional shift (Bialystok, 1999) because they often switch between the two languages. Similar to bilingual children who switch between two languages, high fantasy-oriented children may also display advanced executive functions because they have more practice switching in and out of pretense.

Alternatively, fantasy orientation could be paralleled with other concepts, such as theory of mind, which is thought to be an independently learned concept, disparate from the maturation of general developmental skills, such as executive functions (Wellman, Cross & Watson, 2001). However, the relationship between theory of mind and cognitive development is debated, with several researchers reporting supportive links between theory of mind and executive functions

(Carlson & Moses, 2001; Davis & Pratt, 1996; Frye, Zelazo, & Palfai, 1995; Leslie, 1987). Similar to the suggested relationship between theory of mind and executive functions, fantasy orientation could scaffold executive function development, such that high fantasy-oriented children would have more opportunity to practice executive functions by navigating between fantasy and reality. Therefore, because the relationship between fantasy orientation and executive functions remains unclear, this study investigated if, (1) fantasy orientation provides developmental benefits (e.g., better performance on executive function tasks), and/or if (2) fantasy orientation remains independent from children's executive function abilities. This study was also the first to explore whether or not fantasy orientation is a single construct or whether there are several constructs that make up fantasy orientation which may be individually affected by executive function development. Additionally, this study is unique in that it assessed fantasy orientation and executive function development from three sources: children, parents and teachers, and from two different settings: home and school.

Hypothesis

Children with high fantasy orientation may have more opportunity to use their executive function skills due to their frequent switching between the fantasy and reality realms. Therefore, high fantasy-oriented children should display better performance on executive function tasks compared to moderate and low fantasy-oriented children. High fantasy-oriented children may experience earlier developing executive functions due to their practice switching between the fantasy/reality realms, which would require more use of developmental skills and reveal better inhibition, improved attention shift abilities, and advanced working memory to navigate each realm.

METHODOLOGY

Participants

      Participants were 103 preschool children who averaged 4 years and 11 months at the first assessment ($M = 59.30$, $SD = 6.25$; range = 48.4 months – 74.5 months; 50 females and 53 males). Three participants were excluded from the sample ($n = 106$) because of incomplete sessions, in which two participants relocated and one participant was unresponsive to the experimenter. Thirty-two percent of the families had annual incomes less than $24,999, with 50% of the families having annual incomes that ranged from $25,000 to $64,999, and 18% of the families had annual incomes more than $65,000. Seventy-one percent of parents graduated with a Bachelor's degree or had graduate training/degrees, whereas 20% of parents had partial college experience up to an Associates degree, and 9% of the parents had partial high school experience up to graduating high school. Seventy-three percent of the children were Caucasian, 23% were African American, and 4% were not specified. Exclusion criteria consisted of children failing the warm-up exercise, yet all children ($n = 103$) successfully passed. Children were recruited from local preschools in Tuscaloosa, Alabama. Each participant was interviewed collectively for 2 twenty-five minute sessions and received stickers for participating.

Experimental Stimuli

      This study included a fantasy/reality warm-up exercise, two fantasy orientation interviews, a behavioral inhibitory control task, a cognitive inhibitory control task, a working memory task, an attentional shift task, a task measuring vocabulary level, a parent questionnaire

examining demographics of the family, and parent and teacher questionnaires assessing children's level of fantasy and children's emotion regulation abilities.

In order to measure fantasy orientation, the study used Singer and Singer's Imaginative Play Predisposition (1981) Interview, Taylor and Carlson's Imaginary Companion and Impersonation Interview (1997), and parent and teacher reports on the Fantasy Orientation Questionnaire (Gilpin, 2010).

The following measures assessed children's executive functions. The Gift task was used to measure children's behavioral inhibitory control, which required a stopwatch, gift bag, tissue paper, and a small surprise, such as a sticker (Kochanska et al., 1996). The Animal-Stroop task measured children's cognitive conflict inhibitory control, which required a laptop to administer the custom software program (Wright et al., 2003). The Animal-Stroop task has a validity rate of 93% for reaction times and 65% for number of errors made (Wright et al., 2003). The Standard Dimensional Change Card Sort task served as a measure of children's attentional shift, which required two ballot boxes, one labeled with a blue square and the other labeled with a red star (Standard DCCS, Frye, Zelazo, & Palfai, 1995; Zelazo et al., 2003). Forty additional cards were used to play the color and shape games (10 blue squares, 10 red squares, 10 blue stars, and 10 red stars). The Backward Digit Span task measured children's working memory and required two lists of numbers that each ranged from 2 digits to 6 digits in length (Davis & Pratt, 1996; Halford, Maybery, & Bain, 1988).

Two separate measures were used to statistically control for children's vocabulary level and emotion regulation. Children's receptive vocabulary level was measured using the Peabody Picture Vocabulary Test, Fourth Edition (PPVT-4 Form B; Dunn & Dunn, 2007). This task required an enlarged and colorized picture book and record sheets to score children's responses.

Additionally, children's emotion regulation was measured through parent and teacher reports on the Emotion Regulation Checklist, which consisted of a 24-item questionnaire (ERC; Shields, Cicchetti, & Ryan, 1994).

Procedure

Warm Up Interview. Interviews were conducted in a private room in preschools that was designated for testing. All sessions were videotaped for coding. Each participant was interviewed for two 25-minute sessions. During each session, participants were seated next to the experimenter. The study started with a warm-up exercise consisting of questions about real and pretend entities. The purpose of the warm-up exercise was to allow the child to become comfortable answering questions for the experimenter on camera and to assess whether or not children could correctly identify and distinguish fantastical entities versus real entities (e.g., whether they understood the concept of fantasy). The experimenter asked each child questions about fantasy and reality such as, "Tell me about dogs. Are dogs real or are dogs pretend?" and "What about fish that sing. Are fish that sing real or are fish that sing pretend?" The warm-up exercise consisted of 6 questions total, 3 addressed real entities and 3 addressed pretend entities. Once children answered one question correctly about a real entity and one question correctly about a pretend entity, the experimenter proceeded with all other tasks, which were presented in six predetermined counterbalanced orders. If children did not pass the warm-up exercise, they were excluded from the analyses ($n = 103$).

Executive Function Measures

Children participated in the Gift task, Animal-Stroop task, Standard Dimensional Change Card Sort task, and Backward Digit Span task, which were designed to measure children's executive function abilities.

Behavioral Inhibition. When navigating between fantasy and reality, children use behavioral inhibition, which requires suppressing a behavioral response. For example, when children are pretending that a banana is a telephone, they must inhibit eating it. Therefore, engaging in pretend play and interacting with imaginary companions can possibly scaffold behavioral inhibition skills by providing more opportunities to suppress behavioral responses. To assess children's behavioral inhibition, each child participated in the Gift task (Kochanska et al., 1996), which examined children's behavioral delay of gratification by suppressing an automatic behavior (e.g., peeking). The experimenter told the child s/he has a "big surprise". The child was asked to sit in the chair facing away from the experimenter and asked to not look while the surprise was being wrapped. The experimenter told the children s/he would inform them when s/he was finished wrapping the present. The experimenter noisily wrapped the gift over 60 seconds, and then invited the child to open the present. The experimenter recorded the child's attempts to peek, amount of peeks, and latency to peek. The Gift task was coded by the following three items: (1) peeking, in which children received a score of '0' for fully turning around to peek, score of '1' for peeking over their shoulder, and score of '2' for not attempting to peek, (2) the total times that children tried to peek, and (3) latency to the first peek (in seconds). Experimenters scored the task onsite, and an independent rater coded it again from the videos. Disagreements were resolved by a third rater.

Cognitive Inhibition. When navigating between fantasy and reality, children activate cognitive inhibition, in which they suppress a thought and replace it with an alternative, such as imagining their bedroom as a tree house in the rainforest. Therefore, having fantastical thoughts, interacting with imaginary companion(s), and engaging in pretend play can provide ample opportunities to practice their cognitive inhibition skills, by suppressing an automatic response

16

(e.g., what reality depicts) and instead replace it with an alternative thought (e.g., what they fantasize and imagine). To measure children's cognitive inhibition, children completed the Animal-Stroop task (Wright et al., 2003). Children completed this task on a laptop beginning with a warm-up task in which they identified images that appeared on the screen one by one. For example, children were asked to name a train, plane, etc. During the warm-up, children were also presented with 4 pictures of animals that were used during the task (e.g., duck, sheep, pig, and cow). After the 8 practice warm-up images, the test trials started. During test trials, children were told to name the animals' bodies, rather than the animals' faces, requiring children to inhibit their automatic response of facial recognition. Within the test trials, there were three types of images: stroop, matching, and control. The stroop images were animals that had mismatched faces and bodies, such as a duck face on a cow body. The matching images had the animals' faces and bodies that matched, and the control images were the animals' bodies with cartoon human faces. The test trials were presented in four counterbalanced blocks with 24 images in each trial. Two of the blocks contained only matching images, and the other two blocks contained randomized stroop and control images. In all trials, children were asked to name the animal's *body* as quickly as possible. Response times and errors were recorded to measure children's cognitive inhibitory control. Errors included both incorrect responses and stutters or corrections (e.g., 'pi-duck').

This task was scored by two cognitive inhibition measures: response times and errors made in the matching and stroop trials. Errors were counted when children named an animal incorrectly, or made an articulation error by correcting their response mid utterance (e.g., 'du...cow'). Children's average response time and number of errors were recorded independently for three types of trials: 1) matching trials, in which the animal's face and body matched, 2) stroop trials, in which the animal's face and body mismatched, and 3) control trials,

17

in which the animal's face was a cartoon human face. The difference between the stroop and matching trials were calculated as percentages ((($stroop-matching)/matching$) x 100). Higher percentage scores indicated poorer cognitive inhibition, whereas lower percentage scores indicated better cognitive inhibition.

Attentional Shift. Attentional shift is necessary to cognitively and behaviorally switch back and forth between the fantasy and reality realms. For example, when children are engaging in pretend play, and their play is interrupted by an entity in the real world (e.g., caregiver/teacher), children need the ability to switch from the fantasy realm, into reality, and then back into the fantasy realm to continue playing; therefore, children who often engage in pretend play and interact with imaginary companion(s), have more opportunity to practice shifting their attention from one focus to another. To measure children's abilities to shift their attention, they performed the Standard Dimensional Change Card Sort task (Standard DCCS, Frye, Zelazo, & Palfai, 1995; Zelazo et al., 2003). In this task, children were presented with two small ballot boxes labeled with two different target images (e.g., blue square and red star). The experimenter introduced the boxes with labels and told the child that they were going to play two games, the "shape game" and the "color game". The experimenter explained the rules to the first game (e.g. "shape game"), in which the child was told to place all the *star* cards (both blue and red) in the container labeled with the red *star* and place all the *square* cards (both blue and red) in the container labeled with the blue *square*. After the child performed five consecutive card sorts correctly, the experimenter announced they were going to stop playing the "shape game" and now play the "color game". The experimenter explained the rules to the second game (e.g., "color game"), in which the child was told to place all the *blue* cards (both stars and squares) in the container with the *blue* square and all the *red* cards (both stars and squares) in the container with the *red* star.

The second game of the Standard DCCS task ended when the child performed five consecutive card sorts correctly. The experimenter noted the total number of cards that the child sorted incorrectly during the first game (pre-switch) before sorting five cards correctly consecutively and also noted the total number of cards that the child sorted incorrectly during the second game (post-switch) before sorting five cards correctly consecutively. The amount of incorrect card sorts from both games was calculated. The order of the color game and the shape game was counterbalanced. This task was scored by the following three items: (1) number of inaccurate card sorts in the first game (e.g., pre rule switch), (2) number of inaccurate card sorts in the second game (e.g., post rule switch), and (3) average number of inaccurate card sorts in both games (e.g., overall).

Working Memory. Working memory is a necessary component used in children's engagement in fantasy-oriented activities. Working memory allows children to recall play scripts when shifting to other activities or when play is interrupted. Working memory also allows children to recall which realm they are currently in, whether engaging in a reality setting or playing in a pretend, fantasy realm. To measure working memory, children participated in the Backward Digit Span task (Davis & Pratt, 1996). In this task, the experimenter introduced the child to a puppet. The child was informed that the puppet liked to say everything backward, even digits. The experimenter demonstrated by saying, '3, 6' and the puppet repeated '6, 3'. After completing another example together, the child was offered the puppet and took the role as the puppet by stating the digits backward after the experimenter stated the digits forward from the lists. The experimenter began with two digits from List 1, and if the child was successful in repeating two digits backward, the experimenter proceeded to three digits, then four from List 1. When the child failed to correctly repeat the digits backward, the experimenter returned to the

preceding number of digits on List 2 to confirm that the child could remember the preceding amount (e.g., when the child failed at the four digit trial, the experimenter would do an additional three digit trial). The experimenter recorded how many digits the child could successfully remember, including the numbers that the child recalled even when s/he did not successfully remember the whole set of numbers within the trial.

This task was scored according to the highest amount of digits from two trials that the child successfully repeated backward. An additional '.5' was included in the score for responses in which the child correctly recalled some, but not all, of the set of numbers within a trial. For example, if the child successfully repeated three digits backward from List 1, failed to repeat any of the four digits backward, and then successfully repeated three digits backward from List 2, the participant's score would be '3'. If the child only repeated part of the three numbers within List 2, the participant's score would be 2.5 because s/he successfully repeated part but not all of the numbers within the trial on two accounts.

Fantasy Orientation Measures

Children participated in Singer and Singer's Imaginative Play Predisposition Interview and Taylor and Carlson's Imaginary Companion and Impersonation Interview, which were designed to measure children's fantasy orientation. Parents and teachers completed a fantasy orientation questionnaire that assessed children's belief in fantasy, the type of playful stimuli children engaged in, and an overall rating of children's engagement in fantasy.

Imaginary Companions. Taylor and Carlson's (1997) Imaginary Companion Interview assessed whether or not children had imaginary companion(s). This interview contained a maximum of 10 questions, first addressing whether or not children had imaginary companion(s) and then probing for further details if imaginary companion(s) existed. The following 9 items

assessed children's imaginary companion(s): (1) name(s), (2) whether the companion(s) was a toy or completely pretend, (3) gender(s), (4) age(s), (5) what the companion(s) looked like, (6) what the child liked about the companion(s), (7) what the child disliked about the companion(s), (8) where the companion(s) lived, and (9) where the companion(s) slept. The first question assessed whether or not children had imaginary companion(s). If children had imaginary companion(s) they received a score of '1' and children who did not have imaginary companions(s) received a score of '0'. The 9 follow-up questions were asked if children did have imaginary companion(s) and supported their initial response as to whether imaginary companion(s) actually existed. Scores on this measure ranged from 0 to 1.

Imaginative Play ("Impersonations & Thoughts" and "Toys & Games"). Children responded to a variety of questions that tapped into their type of play and whether they engaged in more fantasy or more reality based play and thoughts. From Singer and Singer's (1981) Imaginative Play Predisposition Interview, children were asked (1) their favorite game, (2) their favorite toy, (3) whether they talked to themselves in bed at night, and (4) what they thought about before they went to sleep at night.

Singer's Imaginative Play Predispostion scale (1981) was used to score the Imaginative Play Predispostion task. Responses that involved fantastical toys or games (e.g., fairies or superheroes) received a score of 2, responses involving representational or animated toys or games (e.g., stuffed animals or toy cars) received a score of 1, and responses involving only realistic toys or games, such as physical activities and games with rules (e.g., checkers or bingo), received a score of 0. Scores on this measure range from 0 to 8, in which children with high fantasy orientation received higher scores. Raters used a standardized list of responses used to code this task in previous research (Boerger, Tullos, & Woolley, 2009; Woolley, Boerger, &

Markman, 2004). Two independent raters coded each child's responses and a third rater resolved any disagreements.

From Taylor and Carlson's (1997) Impersonation Interview, children were asked the following questions to assess their engagement in pretend play and impersonating behaviors: (1) whether they pretended to be an animal, (2) whether they pretended to be a different person, and (3) whether they pretended to be anything unrelated to self, such as a plane. Each of these 3 items had follow-up questions to address what children specifically pretended to be. This measure was scored by tallying the number of 'yes' responses. Scores on this measure ranged from 0 to 3, in which the high scores indicated high fantasy orientation levels. For example, children who pretended to be animal(s), other person(s), and item(s) unrelated to self received 1 point for each 'yes' response. Whereas, when inquiring about children's pretend play, those who did not engage in impersonating behaviors received a score of '0' for each 'no' response.

Parent/Teacher Questionnaires. The parent and teacher of each child separately completed questionnaires, 1) Fantasy Orientation Questionnaire, which assessed children's fantasy orientation level, 2) Emotion Regulation Checklist, which assessed children's emotion regulation, and only parents completed a demographic questionnaire. To measure children's overall fantasy orientation, parents and teachers completed the Fantasy Orientation Questionnaire (Gilpin, 2010), which consisted of the following three questions: (1) child's belief in fantastical figures, (2) child's favorite books, games, television shows, and videogames, and (3) child's level of fantasy orientation using a scale from 1 (strongly interested in reality) to 5 (strongly interested in fantasy). Collecting data from both parents and teachers allowed for more representative reports of children's fantasy orientation in different settings, such that having both

parents' and teachers' data provided stability of fantasy orientation across a variety of places (e.g., home and school).

The Fantasy Orientation Questionnaire was scored in the following manner. Each fantastical figure (e.g., fairies) that the child believed in was scored as '1' when the parent/teacher indicated that the child believed the entity was real, scored as '.5' when the parent/teacher said the child's belief was unknown, and scored as '0' when the parent/teacher said that the child believed that the entity was pretend. Children's favorite books, games, television shows, and videogames were scored from a standardized list of responses used to code similar questions in previous research (Boerger, Tullos, & Woolley, 2009; Gilpin, 2010; Woolley, Boerger, & Markman, 2004). As described in the Imaginative Play coding section above, more reality based items scored '0' and more fantasy based items scored '2'. Lastly, parents' and teachers' overall ratings of their children's/students' level of fantasy orientation were scored on a scale from 1 to 5. Responses that demonstrated strong interest in reality (e.g., plays sports) received a score of '1', sometimes interested in fantasy, but most interested in reality received a score of '2', equally interested in fantastical and reality play/media received a score of '3', mostly interested in fantasy, but sometimes interested in reality received a score of '4', and strongly interested in fantasy (e.g., often engages in pretense, enjoys fantastical books) received a score of '5'.

Control Variables

Two variables were used to control for individual differences in children's fantasy orientation and executive functions.

Emotion Regulation (ERC). The Emotion Regulation Checklist was used to measure children's ability to regulate their emotions (ERC; Shields, Cicchetti, & Ryan, 1995). Parents

and teachers completed this checklist that consisted of 24-items, which measured children's emotion regulation. This measure targeted processes, such as flexibility, intensity, and situational appropriateness. The 24-item ERC was scored accordingly, in which parents and teachers responded to each question: (1) never, (2) sometimes, (3) often, and (4) almost always, with appropriate items reverse coded. The ERC was used as a control in the behavioral inhibition analyses (e.g., Gift task) because children can exercise their ability to suppress their outward emotions similarly to suppressing other behavioral responses (e.g., peeking during the Gift task). Therefore to better eliminate the influence of children's emotion regulation with their behavioral inhibition performance, parent and teacher reports of children's emotion regulation were used as a control variable in the Gift task analyses.

Vocabulary level (PPVT-4). Children also participated in the Peabody Picture Vocabulary Test, Fourth Edition, which measures children's receptive vocabulary level (PPVT-4, Form B; Dunn & Dunn, 2007). This test has a reliability rate of 90%. In this task, children were presented with a colored book consisting of 4 pictures on each page. The experimenter said a vocabulary word that corresponded to one of the 4 pictures, and the child selected the picture that illustrated the word. Children were first tested with pictures of training items (e.g., baby/candy) and after passing the training items, the experimenter continued with the following items, which became progressively harder. On the response sheet where children's responses were recorded, there were a total of 19 sets with 12 items in each set totaling a maximum of 228 items. Once children made 8 or more errors within a set, the experimenter stopped the task.

The PPVT-4 was coded using standard procedures in the Form B manual. First, the raw score was obtained by totaling children's errors (e.g., incorrect response or no response). The amount of errors was subtracted from the maximum item number within the highest set that the

child completed. Once the raw score was calculated, the child's age in months and his/her raw

score were used to calculate a standard score, based on a scale of normed data from the scoring

manual. Carlson and Moses (2001) indicated that children's executive function performance,

such as working memory, is often strongly related to children's individual differences in verbal

ability; therefore, in order to better eliminate the possibility of children's verbal skills

contributing to their working memory performance, children's PPVT standard scores were used

as a control variable in the Backward Digit Span analyses.

RESULTS

To examine whether there were developmental benefits to being a high fantasy-oriented

child, the relationship between children's fantasy orientation and children's performance on

executive function tasks was explored.

Preliminary Analyses

Imaginary Companions. Within the sample of 103 participants, 29 children (11 males

and 18 females) reported having imaginary companions ($M = .28$, $SD = .45$). See Table 1. This is

supported by Taylor's (1999) conservative estimate that 28% of children report having imaginary

companions. Additionally, these data revealed that more females had imaginary companions,

which was corroborated by Carlson & Taylor's (2005) report that not a single study had claimed

boys having more imaginary companions than girls. For example, Mauro's (1991) found that

64% of children with imaginary companions were female. There were 14 four-year-olds and 15

five-year-olds who reported having imaginary companions, which suggests that the creation of

imaginary companions remains stable across age, with no significant age differences. See Table

2.

Imaginative Play. Children's imaginative play was identified through three fantasy

components. First, the "Impersonations and Thoughts" component had scores that ranged from 0

to 6 ($M = 3.23$, $SD = 1.55$), with low fantasy ranging from 0 to 2, moderate fantasy as 3, and high

fantasy ranging from 4 to 6. Secondly, the "Toys and Games" construct ranged from 0 to 4 ($M =$

1.95, $SD = 1.08$), with low fantasy ranging from 0 to 1, moderate fantasy as 2, and high fantasy

ranging from 3 to 4. Lastly, the third construct, "Parent/Teacher Questionnaires", ranged from 1

to 5 ($M = 3.14$, $SD = .78$), with low fantasy ranging from 1 to 2, moderate fantasy as 3, and high fantasy ranging from 4 to 5. See Table 7.

Behavioral Inhibition. The Gift task consisted of three separate items that measured children's behavioral inhibition. The first item of the Gift task examined whether or not children peeked during the task, with scores ranging from 0 to 2 ($M = 1.32$, $SD = .81$). Forty-six percent of children peeked during the Gift task (e.g., looked over their shoulder or fully turned around to peek) whereas 54% of children did not peek and were able to suppress their desire to peek throughout the duration of the task (60 seconds). The second item of the Gift task examined how many times children peeked, if at all, which ranged from 0 to 12 peeks ($M = 1.25$, $SD = 2.25$), with 88% of the children peeking 2 or fewer times during the task. The third item of children's behavioral inhibition was measured by their latency to first peek, which ranged from 3 seconds to 60 seconds, with 60 seconds indicating that children did not peek ($M = 45.58$, $SD = 19.03$). Of the children who peeked, 52% peeked during the first half of the task (before 30 seconds) with the remaining 48% of children peeking during the second half of the task (30 seconds or later).

Cognitive Inhibition. The Animal-Stroop task consisted of 2 items that measured children's conflict cognitive inhibition: 1) response times, which were expressed in percentages, and 2) overall errors, which were calculated from the difference of errors during the matching trials and errors during the stroop trials. First, children's response time percentages ranged from -24.22% to 167.89% ($M = 74.17$, $SD = 36.68$), with half of the sample having less than 66%, in which lower percentages indicated better cognitive inhibition. Secondly, the difference in the number of errors made during the matching and stroop trials ranged from -3 to 8 errors ($M = 1.88$, $SD = 2.14$), with fewer errors indicating better cognitive inhibition.

Attention Shift. The Standard Dimensional Change Card Sort task ranged from 0 to 17

overall incorrect card sorts ($M = .82$, $SD = 2.20$) and children's number of incorrect card sorts post-switch rules ranged from 0 to 18 cards ($M = 1.06$, $SD = 2.61$). There was a ceiling effect, in which 69% of the sample had 0 incorrect card sorts post-switch rules. This indicated that children were able to successfully complete this task managing both sets of rules, pre- and post-switch. Additionally, there was limited variability in children's overall incorrect card sorts, such that 90% of sample had 1 or fewer incorrect card sorts post-switch. This also supported that children were able to successfully manage both sets of rules, pre- and post-switch.

Working Memory. The Backward Digit Span task scores ranged from children recalling 0 to 4 digits backward ($M = 1.14$, $SD = 1.06$). These data revealed a floor effect, such that 55% of children did not successfully pass the first trial. That is, these children could not successfully recall 2 digits backward and were not able to perform this task. A floor effect was also evident with Carlson's (2005) data, such that 75% of 4-year old children did not pass the BDS task. Similar to Carlson's previous findings (2005), it is not yet possible to differentiate whether children have not mastered the skill to comprehend and/or perform the BDS task.

Socioeconomic Status (SES). When comparing children from low socioeconomic statuses ($n = 21$) to middle and high SES ($n = 82$), fantasy orientation measures did not significantly differ according to socioeconomic status. That is, regardless of SES, children were equally comparable with no significant differences in having imaginary companion(s), $r = .06$, $p = $ ns, and no significant differences in engaging in pretend play, $r = .104$, $p = $ ns. For example, children had similar amounts of imaginary companions ($M_{\text{Low SES}} = .33$ versus $M_{\text{Mid/High SES}} = .27$) and engaged in comparable amounts of reality based and fantasy based play ($M_{\text{Low SES}} = 5.57$ versus $M_{\text{Mid/High SES}} = 5.09$). See Table 5.

However, whereas the two SES groups did not vary significantly in children's amount of

fantasy engagement, there were some differences in executive function performances, although not statistically significant. For example, the low SES sample displayed slightly poorer working memory, in which they recalled fewer digits during the Backward Digit Span task ($M_{\text{Low SES}}$ = 1.08 versus $M_{\text{Mid/High SES}}$ = 1.20). Children from the low SES group also had slightly poorer attention shift abilities compared to children in the middle and high SES group. That is, low SES children performed more incorrect card sorts overall ($M_{\text{Low SES}}$ = .87 versus $M_{\text{Mid/High SES}}$ = .76) and had more incorrect card sorts post-switch, after having to manage both sets of rules ($M_{\text{Low SES}}$ = 1.37 versus $M_{\text{Mid/High SES}}$ = .73) compared to the middle and high SES group. Children from low SES also had slightly poorer cognitive inhibition evident by making more errors ($M_{\text{Low SES}}$ = 1.94 versus $M_{\text{Mid/High SES}}$ = 1.82) and having higher response time percentages ($M_{\text{Low SES}}$ = 76.04% versus $M_{\text{Mid/High SES}}$ = 72.38%) during the Animal-Stroop task. See Table 6.

Fantasy Orientation Measures

As previous researchers (Taylor, Cartwright, & Carlson, 1993; Taylor & Howell, 1973) have speculated separate constructs of fantasy orientation, these are the first data to explore and reveal four disparate components across the fantasy orientation measures, including children, parent and teacher data. Principal Components Analysis revealed four fantasy orientation components: 1) "Impersonations and Thoughts", which highlighted children's engagement in fantastical thoughts and pretending to be other entities, 2) "Parent and Teacher Questionnaires", which consisted of parent and teacher reports of children's overall fantasy orientation, 3) "Imaginary Companions", which assessed children's reports as to whether or not they had imaginary companion(s), and 4) "Toys and Games", which assessed the fantasy level of children's reported favorite toys and games. Each construct is further explained below.

To categorize children's fantasy orientation into distinct components, a Principal

Components Analysis (PCA) was performed to assess which fantasy orientation items clustered together to form a single construct. The PCA revealed four distinct components from the fantasy orientation measures. The first component ("Impersonations and Thoughts") consisted of five fantasy orientation measures: three Impersonation Interview questions (whether children pretend to be a person, animal, or other entity) and two Imaginative Play and Predispostion Interview questions (whether children talk to themselves before going to bed and what children think about before going to bed, Eigenvalue = 2.066, factor loadings ranged from .433 to .738). Using Pearson's correlation, there were three significant correlations among the items within the "Impersonation and Thoughts" component: (1) whether children pretended to be an animal and other person, $r = .235$, $p = .01$, (2) whether children pretended to be another person and other entity, $r = .239$, $p = .01$, and (3) whether children talked to themselves before they went to bed at night and what they thought about before they when to sleep, $r = .295$, $p = .003$. The second component ("Parent and Teacher Questionnaires") included both the parents' and teachers' ratings of children's overall fantasy orientation (Eigenvalue = 1.557, factor loadings, .535 and .651), in which parents' and teachers' ratings were significantly correlated, $r = .226$, $p = .05$. The third component ("Imaginary Companions") included the first question from the Imaginary Companion Interview that assessed whether or not children had imaginary companion(s), which loaded onto a separate category by itself (Eigenvalue = 1.261, factor loading was .819). The fourth component ("Toys and Games") included two Imaginative Play and Predisposition Interview questions (children's favorite toy(s) and children's favorite game(s), Eigenvalue = 1.167, factor loadings, .407 and .546), in which children's favorite toys and games were correlated, $r = .246$, $p = .01$. Composite scores were calculated for these four components: "Impersonations and Thoughts", "Parent and Teacher Questionnaires", "Imaginary

Companions", and "Toys and Games". Each of the four composite scores was used in the

following analyses to determine if fantasy orientation was related to children's executive

function skills. See Table 7.

Executive Function Measures

Behavioral Inhibition. In order to examine children's behavioral inhibition abilities in

relation to their fantasy orientation, the four PCA fantasy orientation components were correlated

with children's performance on the Gift task. These data revealed that high fantasy-oriented

children had better behavioral inhibition skills, indicating better behavioral executive function

development. Using hierarchical linear regression, controlling for children's age in months and

emotion regulation (ERC), parent and teacher ratings of children's overall fantasy were related to

children's ability to not peek during the Gift task, $F(2,88) = 3.62$, $p = .03$, $\beta = .29$. That is,

children who were rated as high fantasy-oriented by both teachers and parents had better

behavioral suppression by not peeking as often during the Gift task compared to low and

moderate fantasy-oriented children. Additionally when controlling children's age in months and

emotion regulation (ERC), parent and teacher ratings of children's overall fantasy were

significantly related to children's amount(s) of peeking during the Gift task, $F(3, 86) = 3.13$, $p =$

.03, $\beta = -.63$, indicating that children who were rated as high fantasy-oriented by both teachers

and parents had better behavioral suppression by peeking fewer times than children who were

low and moderate fantasy-oriented. Teacher reports of children's emotion regulation (ERC) were

correlated with children's amount of peeks during the Gift task, $r = -.218$, $p = .029$. Lastly when

controlling for children's age in months and emotion regulation (ERC), parent and teacher

ratings of children's overall fantasy were significantly related to children's latency to first peek

during the Gift task, $F(3, 83) = 4.91$, $p = .003$, $\beta = 9.17$, in which high fantasy-oriented children

took longer to peek during the Gift task compared to low and moderate fantasy-oriented children, thus indicating better control of delaying gratification. Overall, high fantasy-oriented children revealed better behavioral inhibition skills during the Gift task, by: (1) being less likely to peek, (2) peeking fewer times when they did fail to delay gratification for 60 seconds, and (3) having a longer latency to peek, compared to low and moderate fantasy-oriented children. See Table 7.

Working Memory. In order to examine children's working memory abilities in relation to their fantasy orientation, the four fantasy orientation components were compared to children's performance on the Backward Digit Span task. These data revealed mixed results about high fantasy-oriented children. Using hierarchical linear regression, controlling for children's age in months and vocabulary level (PPVT-4), results revealed that fantasy orientation, as reported by parent and teacher overall ratings, was significantly related to children's working memory, F (2, 89) = 6.52, p = .002, β = .31. This relationship revealed that children with high fantasy orientation performed better on the working memory task by remembering *more* digits than children who were low and moderate fantasy-oriented. On the other hand, fantasy orientation as measured by the "Toys and Games" component, was also significantly related to children's working memory, F (2, 99) = 6.53, p = .002, β = -.20. However, this relationship revealed that children who preferred more imaginative and fantasy-oriented toys and games recalled *fewer* digits during the Backward Digit Span task. The other two fantasy orientation components, "Impersonations and Thoughts" and "Imaginary Companions", were not significantly related to children's working memory. See Table 7.

Measures of cognitive inhibition (Animal-Stroop task) and attentional shift (Standard Dimensional Change Card Sort task) were not found to be related to any of the four components of fantasy orientation. See Table 7.

DISCUSSION

The primary purpose of this study was to examine whether there may be a relationship between children's level of fantasy orientation and their developing executive functions. Results indicated that children's fantasy orientation is related to executive function development. Specifically, results suggest that high fantasy orientation may boost the development of *behavioral* executive function skills, such as behavioral inhibition, and possibly working memory.

Pretend play is one area that comprises children's fantasy orientation. Pretend play is naturally an active behavioral occupation, and this active aspect may explain part of the relationship between fantasy orientation and executive functions, especially the relationship between fantasy orientation and behavioral inhibition. These data indicate that fantasy orientation tasks (Singer & Singer's Imaginative Play and Predisposition Interview, 1981; Taylor & Carlson's Imaginary Companion and Impersonation Interview, 1997; Gilpin's Parent/Teacher Fantasy Orientation Questionnaire, 2010) that measure children's outward behavioral expressions (as measured by parents' and teachers' observations of pretend behavior) are significantly related to children's developing executive functions. For example, children who were rated by parents and teachers as high fantasy-oriented displayed better behavioral inhibition skills compared to children with low and moderate fantasy orientation. Children's behavioral inhibition performance was obtained during 3 points of the Gift task. First, high fantasy-oriented children did not peek as often during the Gift task, which exemplifies their ability to better suppress behavioral gratification. Second, of the children who did peek during the Gift task, high

fantasy-oriented children peeked fewer times compared to low and moderate fantasy-oriented children. That is, high fantasy-oriented children looked over their shoulders fewer times and fully turned around to look at the experimenter fewer times compared to low and moderate fantasy-oriented children. Overall, high fantasy-oriented children displayed better behavioral inhibition indicating behavioral benefits. Thus, high fantasy-oriented play and activity might facilitate a boost in behavioral executive functions by providing more opportunities to suppress fantastical play when reality interrupts pretense.

Children's level of fantasy orientation was also related to their developing working memory skills; however, the results were somewhat mixed. Children's working memory was positively related to parents' and teachers' reports of children's pretense behaviors, indicating that children who display high fantasy-oriented behaviors also displayed better working memory skills. However, children's preferred toy(s) and game(s) were inversely related to children's working memory. That is, children who were judged as high fantasy-oriented by expressing a preference for imaginative toy(s) and game(s) displayed poorer working memory by recalling fewer digits during the Backward Digit Span task compared to low and moderate fantasy-oriented children. The relationship between fantasy orientation and working memory may become clearer as children's working memory skills develop further. In preschool-aged children, the BDS task greatly taxes children's executive function resources (Carlson, 2005). Although some four-year-olds could complete the task, there was a large floor effect, with 28% of children not able to perform the task to any degree. As typically developing children's executive functions mature with age, there might be a more apparent relationship between children's working memory and fantasy orientation.

Interestingly, the fantasy orientation components that are related to a boost in executive

function development seem to be behavioral aspects of fantasy orientation, as reported by parent and teacher observations. For example, the relationship between fantasy orientation and working memory, in terms of children's outward behavioral indicators of fantasy orientation, mirrors well the relationship between fantasy orientation and behavioral measures of inhibition. In both working memory and inhibition, behavioral aspects of fantasy orientation and executive function may be responsible for the boost in executive function development in high fantasy-oriented children. Thus, these data suggest fantasy orientation does not affect the development of executive functions globally, but rather, might have specific, targeted effects on developing executive functions. Behaviors associated with being a high fantasy-oriented child that parents and teachers can observe, such as engaging in pretend play and highly fantastical games, might boost development of the behavioral aspects of executive functions, such as behavioral inhibition.

A second goal of this research was to examine the variation within the fantasy orientation construct. Previous researchers have speculated that there may be individual differences in children's fantasy orientation. For example, it is possible that a child who engages in high fantasy play does not have imaginary companions and vice versa. A Principal Components Analysis revealed four distinct fantasy orientation components in these data: (1) Impersonations and Thoughts, (2) Imaginary Companions, (3) Toys and Games, and (4) Parent and Teacher Questionnaires. Each component included item(s) that were similar to one another, yet each component assessed different areas of fantasy. For example, 'Impersonations and Thoughts' included children's impersonation tendencies (e.g., pretending to be an animal, person, other entity) as well as their imaginative thoughts (e.g., what children think about before going to sleep and if they talk to themselves in bed at night). The 'Toys and Games' component included the

toys and games that children identified as their favorites. The 'Parent and Teacher Questionnaires' component included parent and teacher reports of their observations of children's engagement in fantasy related activities, such as engaging in pretend play. Lastly, the 'Imaginary Companions' component consisted of whether or not children reported having imaginary companion(s). These disparate constructs suggest that fantasy orientation is one term, yet it encompasses multiple aspects of fantasy behavior and cognition.

Similar to executive function being considered one term that is comprised of a variety of functions, these data suggest that fantasy orientation is comprised of multiple constructs. Specifically considering the two areas of fantasy orientation that were explored in this study (e.g., imaginary companions and imaginative play), these two concepts are quite different from one another. For example, children envisage imaginary companions, which relies on more cognitive based skills, whereas children engage in pretend play such as fantasy play, which involves more behavior based activity. Thus, these four different constructs of fantasy orientation corroborate previous researchers' speculations that there are different components that comprise fantasy orientation (Taylor, Cartwright, & Carlson, 1993; Taylor & Howell, 1973). This is important because it allows for researchers to better define what fantasy orientation is comprised of and to better assess individual differences in fantasy orientation. Additionally, these components of fantasy orientation can provide clearer definitions of fantasy orientation, for which researchers can further explore its relationship with other developmental skills, such as executive functioning, language development, theory of mind, and socialization. For example children who exhibit high levels of cognitive aspects of fantasy orientation, such as having an imaginary companion, might display cognitive boosts, such as better language skills or theory of mind (Bouldin, Bavin, & Pratt, 2002; Taylor & Carlson, 1997; Trionfi & Reese, 2009), whereas

children who demonstrate high levels of pretend (fantastical) play might demonstrate boosts in behavioral control, as these data suggest. Researchers may also consider that varying fantasy orientation constructs may contribute differently to social development (Gleason, 2002; Mauro, 1991; Nagera, 1969; Taylor, Carlson, Maring, Gerow, & Charley, 2004).

Some researchers argue that fantasy orientation is an independent construct, like theory of mind, which is not related to general cognitive development, such as the development of executive functions (Wellman, Cross & Watson, 2001). Alternatively, other researchers argue that theory of mind development is somewhat dependent on the development of general cognitive abilities (Davis & Pratt, 1996; Leslie, 1987; Carlson & Moses, 2001). The current study supports the latter hypothesis, demonstrating that there may be some specific developmental benefits to being a high fantasy-oriented child. Children high in fantasy orientation may get a developmental boost in the maturation of executive functions, such as behavioral inhibition and possibly also working memory, from their pretense behavior.

Whereas historical perspectives of childhood imagination have suggested that highly imaginative children may be atypical or possibly even mentally ill, these data suggest that children's natural tendency to engage in imaginative and fantastical play behaviors may foster the maturation of specific developmental skills, such as behavioral inhibition and working memory. Thus, parents and teachers should not discourage children's imaginative play, but rather let it naturally foster the development of executive functions and other emerging skills.

The relationship between fantasy orientation and executive functions could possibly have long-term effects throughout the course of the lifespan. For example, engaging in fantastical play during early childhood could provide developmental benefits that remain evident throughout the life span, such that stimulating cognitive, social, and physical activities through pretend play in

childhood could delay onset of dementia in adulthood (Bialystok & Craik, 2010; Stern, 2002). Additionally, fantasy orientation in adults, as observed by adults having creative hobbies and jobs, could buffer cognitive and behavioral functions by protecting individuals from age related decline. Future studies should explore whether childhood pretend play fosters better developmental skills, both beneficial during childhood and lasting throughout a lifetime, and whether or not having a(n) creative/imaginative outlet as an adult also provides a boost in executive functions.

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Table 1

Means and (Standard Deviations) of Males' and Females' Fantasy Orientation Measures.

Fantasy Orientation Measures	Sex of Participant		Overall Range
	Males (*n* = 53)	Females (*n* = 50)	
With Imaginary Companions	.21 (.41)	.36 (.49)	0-1
Pretend to be animal(s)	.69 (.47)	.86 (.41)	0-2
Pretend to be person(s)	.52 (.51)**	.71 (.46)**	0-1
Pretend to be entity other than self	.54 (.50)	.53 (.50)	0-1
Preferred Game	.85 (.83)	.64 (.72)	0-2
Preferred Toy	1.23 (.68)	1.18 (.48)	0-2
Talk to self in bed at night	.48 (.51)	.58 (.50)	0-1
Thoughts before going to bed	.69 (.78)	.88 (.77)	0-2

Note. N = 103
**t (98.84) = 2.04, *p* < .05

Table 2

Means and (Standard Deviations) of 4- and 5-Year Olds' Fantasy Orientation Measures.

	Age of Participant	
Fantasy Orientation Measures	4-year-olds ($n = 52$)	5-year-olds ($n = 50$)
With Imaginary Companions	.27 (.45)	.30 (.46)
Pretend to be animal(s)	.81 (.45)	.73 (.45)
Pretend to be person(s)	.58 (.50)	.65 (.48)
Pretend to be entity other than self	.58 (.50)	.49 (.51)
Preferred Game	.62 (.80)	.88 (.75)
Preferred Toy	1.17 (.55)	1.24 (.63)
Talk to self in bed at night	.60 (.50)	.46 (.50)
Thoughts before going to bed	.85 (.78)	.72 (.78)

Note. N = 102

Table 3

Means and (Standard Deviations) of Males' and Females' Executive Function Measures.

	Sex of Participant		
Executive Function Measures	Males (*n* = 52)	Females (*n* = 50)	Overall Range
Animal-Stroop: Reaction Time%	76.04 (37.88)	72.38 (35.84)	-24.22 -167.89
Animal-Stroop: Errors	1.94 (2.36)	1.82 (1.92)	-3 - 8
Gift Task: Peek	1.29 (.82)	1.36 (.80)	0 - 2
Gift Task: Amount	1.13 (1.80)	1.36 (2.65)	0 - 12
Gift Task: Latency	45.83 (19.08)	45.33 (19.19)	3 - 60
Backward Digit Span (BDS) Task	1.08 (1.04)	1.20 (1.09)	0 - 4
Card Sort (SDCCS): Average	.87 (2.44)	.76 (1.94)	0 - 17.5
Card Sort (SDCCS): Post-switch	1.37 (3.19)	.73 (1.78)	0 - 18

Note. N = 102

Table 4

Means and (Standard Deviations) of 4- and 5-Year Olds' Executive Function Measures.

	Age of Participant	
Executive Function Measures	4-year-olds ($n = 52$)	5-year-olds ($n = 51$)
Animal-Stroop: Reaction Time%	78.12 (33.22)	69.70 (40.21)
Animal-Stroop: Errors	2.55 (2.19)***	1.15 (1.85)***
Gift Task: Peek	1.29 (.85)	1.36 (.78)
Gift Task: Amount	1.40 (2.56)	1.08 (1.88)
Gift Task: Latency	46.9 (18.0)	44.19 (20.17)
Backward Digit Span (BDS) Task	1.11 (1.02)	1.17 (1.103)
Card Sort (SDCCS): Average	.79 (2.39)	.85 (2.02)
Card Sort (SDCCS): Post-switch	1.29 (3.00)	.82 (2.13)

Note. $N = 103$
***$t(82) = 3.14$, $p < .005$

Table 5

Means and (Standard Deviations) of Children's Fantasy Orientation Measures According to Socioeconomic Status.

	Level of Socioeconomic Status	
Fantasy Orientation Measures	Low (*n* = 21)	Middle/High (*n* = 82)
With Imaginary Companions	.27 (.45)	.30 (.46)
Pretend to be animal(s)	.81 (.45)	.73 (.45)
Pretend to be person(s)	.58 (.50)	.65 (.48)
Pretend to be entity other than self	.58 (.50)	.49 (.51)
Preferred Game	.62 (.80)	.88 (.75)
Preferred Toy	1.17 (.55)	1.24 (.63)
Talk to self in bed at night	.60 (.50)	.46 (.50)
Thoughts before going to bed	.85 (.78)	.72 (.78)

Note. N = 103

Table 6

Means and (Standard Deviations) of Children's Executive Function Measures According to Socioeconomic Status.

Executive Function Measures	Level Of Socioeconomic Status	
	Low (*n* = 21)	Middle/High (*n* = 82)
Animal-Stroop: Reaction Time%	76.04 (37.88)	72.38 (35.84)
Animal-Stroop: Errors	1.94 (2.36)	1.82 (1.92)
Gift Task: Peek	1.29 (.82)	1.36 (.80)
Gift Task: Amount	1.13 (1.80)	1.36 (2.65)
Gift Task: Latency	45.83 (19.08)	45.33 (19.19)
Backward Digit Span (BDS) Task	1.08 (1.04)	1.20 (1.09)
Card Sort (SDCCS): Average	.87 (2.44)	.76 (1.94)
Card Sort (SDCCS): Post-switch	1.37 (3.19)	.73 (1.78)

Note. N = 103

Table 7

Hierarchical Linear Regression Results of Children's Fantasy Orientation Compared to Performance on Executive Function Tasks (ß reported).

	Fantasy Orientation Components			
Executive function tasks	Impersonations & Thoughts	Parent/Teacher Questionnaires	Imaginary Companions	Toys & Games
Animal-Stroop: Reaction Time%	2.16	-.80	-10.60	-4.08
Animal-Stroop: Errors	.13	-.40	.82	.33
Gift Task: Peek	.02	.29**	-.21	.01
Gift Task: Amount	.02	-.63†	.40	-.16
Gift Task: Latency	.05	9.17***	-6.43	-1.47
Backward Digit Span (BDS) Task	.04	.31**	-.24	-.20**
Card Sort (SDCCS): Average	-.21	.02	-.09	.23
Card Sort (SDCCS): Post-switch	.04	-.22	-.37	.37

Note. N = 103
† $p < .07$, ** $p < .05$, *** $p < .01$