

DEVELOPMENT AND INITIAL VALIDATION OF A SCALE MEASURING
YOUNG CHILDREN'S AWARENESS OF TRAIT
COGNITIVE CONTROL

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DISSERTATION ABSTRACT

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Title: Development and Initial Validation of a Scale Measuring Young Children's Awareness of Trait Cognitive Control

Success in early childhood requires fluent cognitive control functioning and the ability to select and execute effective regulatory strategies across many new contexts including academics and social interactions. Cognitive control functioning has been positively linked to a host of important short- and long-term outcomes across many diverse domains. A wealth of research on self-efficacy, self-concept, and implicit theories of cognitive processes demonstrates that individuals' self-perceptions of ability and cognition substantially influence important behavioral outcomes, namely academic performance. Investigations into the mechanisms underlying these links suggest that self-perceptions of abilities impact academic outcomes by differentially influencing the self-regulated learning behaviors that individuals choose to engage. Despite this knowledge, and evidence suggesting that capturing such self-perceptions from young children is highly plausible, the extent to which young children can reflect and report on their own cognitive control abilities has not been investigated. In this dissertation, I develop and validate an interview scale that aims to probe children's self-perceptions of their cognitive control abilities using the Berkeley Puppet Interview administration format.

Scale analyses of interviews from 125 children aged 4- through 7-years suggest the scale elicits responses that cluster around two correlated, but separable components: Self- and Emotion-Regulation and Attention Modulation. Responses on these two subscales were reliable, showing moderate to strong internal consistency. Subscale scores were strongly correlated with parent reports of similar skills, and self-reports of related constructs, but showed no such relations with behavioral tasks measuring executive functioning abilities. The findings suggest that young children are capable of reflecting and reporting on their own cognitive control skills, and that these skills correspond to parent reports of similar abilities. Further scale refinement and targeted validation efforts are called for; however, these encouraging early results suggest the new scale holds potential to play a key role in uncovering ways in which children's self-perceptions influence their learning success.

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CHAPTER I

INTRODUCTION

Children's entry into a formal school setting engenders substantial change in expectations for their classroom behavior, independence, social interaction, and academic performance. Success in all of these domains requires fluent cognitive control functioning and effective selection and execution of strategies across many different contexts. At present, current research evidence does not provide information about how to help children in situations where they have available strategies but are not using them appropriately. Nor does any current research identify the extent to which young children have a sense of their own cognitive control skills or whether the level of sensitivity in this respect might impact successful deployment of appropriate regulatory strategies.

Understanding more about what children know and can report about their cognitive and self-control abilities seems an important step toward ultimately helping children discover and execute appropriate strategies for success across the many new contexts they experience as they enter a formal schooling environment. In this dissertation, I develop and validate an instrument that may provide such insight into young children's awareness of their cognitive control skills. To motivate this project and hypotheses, I begin by assembling strands of evidence from a variety of literatures that speak to young children's ability to report on their control in the cognitive arena, the important role that self-perceptions of abilities play in successful functioning across domains, and discuss key methodological considerations for attempting to capture young children's self-perceptions of cognitive control.

Importance of Cognitive Control Skills in Early Childhood

To begin, I will focus on delineating terms and constructs that are key to considering the question of children's ability to report on their cognitive skills. Over the past decades, a wealth of research across several fields has investigated, at various levels of abstraction, the nature, development, and effects of individuals' ability to monitor and regulate emotions, attention, and behaviors in service of goals. Terminology and specific definitions vary both between and within research subfields. Cognitive neuroscience researchers focus on what is termed 'cognitive control' which is defined generally as one's ability to flexibly adapt behaviors and cognitive information processing in service of an internal goal (Hutchison & Morton, 2016). Social psychologists and education researchers view 'self-regulation' and 'self-control', terms often used interchangeably within the field, as the ability to modify and regulate emotions and behaviors in service of goals (Blair, 2002; Carver & Scheier, 1998; Hagger, Wood, Stiff, & Chatzisarantis, 2010). Cognitive and developmental psychologists have focused on 'executive function' skills which are considered to be a set of multidimensional cognitive abilities used to control thoughts, emotions, and actions (Diamond, 2014). Often these cognitive abilities are thought to subserve the behavioral manifestations of self-regulation and self-control typically studied in social psychology (Heatherton, 2011). Researchers have made noble attempts to disambiguate these terms (e.g., Eisenberg & Zhou, 2016; Hofmann, Schmeichel, & Baddeley, 2012; Rueda, Posner, & Rothbart, 2005), which have largely resulted in further differences in opinion as to the hierarchical relations among these constructs. As I am interested in the extent to which children's abilities on all of these constructs might be influenced by their self-awareness of such skills, for purposes of this

project, I am opting to use the term ‘cognitive control’ to refer to the broad constellation of stable cognitive abilities involved in monitoring, regulating, and adapting information processing and behavior in service of goals.

Overall, the body of research within psychology and education has demonstrated that, although young children’s self-regulation and executive function skills tend to increase with age into middle childhood, individual differences among these cognitive control skills seem to remain fairly stable across the lifespan (Casey et al., 2011; Raffaelli, Crocket, & Shen, 2005; Zelazo & Carlson, 2012). These lines of research have also established reliable links between cognitive control skills in early childhood and many important short- and long-term outcomes. In particular, the extent to which young children are able to regulate emotions, attention, and behaviors in service of goals predicts such outcomes as school readiness (Son, Lee, & Sung, 2013), math and literacy scores (Schmidt, Pratt, & McClelland, 2014), high school graduation rates (Vitaro, Brendgren, Larose, & Tremblay, 2005), as well as problem behaviors in the classroom (Rimm-Kauffman, La Paro, Downer, & Pianta, 2005), delinquency, aggression, and childhood obesity (McCabe & Brooks-Gunn, 2007). Recent longitudinal research suggests the effects of early cognitive control skills continue well into adulthood, predicting financial health, criminal behavior, substance dependence, and a panoply of physical health outcomes (Moffitt et al., 2011). The relations between early life self-control skills and later life outcomes hold even when controlling for family environment, intelligence, socio-economic status, and adolescent transgressions.

Cognitive control skills have drawn interest from a wide variety of scientific fields in the last decades. Despite this hefty, reliable package of research that spans the

social, behavioral, educational, and economic sciences, mysteries remain regarding the manner in which cognitive control skills emerge, what accounts for differences in abilities across children, and the mechanisms through which cognitive control skills impact relevant outcomes. Simultaneously, a growing body of research in cognitive developmental science suggests that children's self-perceptions of skills and knowledge have meaningful impacts on the ways in which children make use of their cognitive abilities (e.g., Bong & Skaalvik, 2013; Dweck & Leggett, 1988; Lyons & Ghetti, 2011; Lyons & Ghetti, 2013). One important step that science can take toward better understanding how cognitive control skills, in particular, emerge and influence individual lives is to discover the extent to which young children can systematically report on their own skills and what they think about how and when to use them.

In this dissertation, I will argue that children's understanding of their own cognitive control functioning may play an important role in successful deployment of regulatory strategies and that young children are capable of providing reliable self-reports of their stable cognitive control skills. I will also argue that gaining a better understanding of the degree to which children are able to reflect and report on their cognitive control skills will provide important new knowledge about young children's cognitive control skill development. This new knowledge has potential to have a significant impact on the ways in which adults and educators help children discover the best regulatory strategies for success across contexts.

Self-Beliefs and Implicit Theories Matter for Performance

Our perceptions of ourselves, the world, and how the world works shape our actions and behaviors within it. The ability to successfully act on intentions and goals can

be undermined when our perceptions diverge substantially from reality (Klassen, 2006). Research in the fields of self-efficacy and self-concept demonstrate that self-beliefs about context-specific and global individual abilities and tendencies meaningfully influence the behaviors and strategies individuals employ towards a goal (Bong & Skaalvik, 2013; Caprara, Vecchione, Alessandri, Gerbino, & Barbaranelli, 2011; Marsh & Martin, 2011). For example, evidence from the field of self-efficacy, the belief in one's ability to successfully perform a specific behavior, demonstrates that, over and above objective measures of skill levels, cognitive abilities, or past performances, self-perceptions significantly impact performance, and these perceptions influence countless decisions and goal-related actions (Bandura, 1993; Bouffard-Bouchard, 1990; Bouffard-Bouchard, Parent, & Larivee, 1991; Collins 1982; Schunk, 1990). Self-concept – a self-perception construct closely related to, but empirically distinct from self-efficacy – has also been shown to be importantly related to academic outcomes among students across a wide age range, further suggesting that self-perceptions of skills, both global and task-specific, matter for practical outcomes (e.g., Marsh & Martin, 2011; Parker, Marsh, Ciarrochi, Marshall, & Abduljabbar, 2014).

The rich and broad literature of research on implicit theories offers another insight into the ways in which perceptions of cognition can influence important behaviors and outcomes. The theories that individuals hold about the nature of certain psychological processes or traits, such as intelligence, are predictive of behaviors related to how and when they deploy those abilities (e.g., Dweck & Leggett, 1988; Dweck, 1999; Job, Dweck & Walton, 2010; Mueller & Dweck, 1998). This field of research has identified that children, adolescents, and adults who believe that intelligence is “incremental” or

malleable in nature and can be improved with effort tend to show increased academic achievement over those who believe that intelligence is a fixed “entity” that one is born with and cannot be changed (e.g., Dweck & Leggett, 1988; Dweck, 1999; Mueller & Dweck, 1998). Although these theories tend to be fairly stable across the lifespan, (Robins & Pals, 2002), intervention studies have shown that these mindsets can be induced with long-lasting effects on practical real-life academic achievement outcomes including grades and standardized test scores (Aronson, Fried, & Good, 2002; Blackwell, Trzesniewski, & Dweck, 2007). Investigations into how and why these self-theories can have such wide-ranging and lasting effects suggest that implicit theories of intelligence shape individuals’ learning goals and impact achievement outcomes by influencing the selection and use of self-regulated learning strategies (see Dweck & Master, 2008 for a review).

While research on self-perceptions of individual skills, described above, highlights the important role these self-reflections play in influencing important outcomes, research on the effects of implicit theories of intelligence and self-regulation offer further indications that early in life, children have acquired a stable, but malleable, sense of the nature of cognition. These implicit theories of how cognition functions substantially impact the learning behaviors children engage in, which have long-term implications for developmental and academic success (Blackwell, Trzesniewski, & Dweck, 2007). Similarly, implicit beliefs about the nature of cognitive control influences individuals’ execution of such skills (Job, Dweck, & Walton, 2010). Children’s self-perceptions of their own cognitive control skills may similarly influence the manner and extent to which those skills are employed across contexts.

This research demonstrates that by a very early age, children have already acquired a sense of how complex cognitive systems function, how their individual skills tend to manifest across a variety of contexts, and are using this information to guide their decisions and behaviors. Together, these literatures provide compelling support for the hypothesis that the beliefs that children have about their own cognitive control skills may be importantly influencing their successful use of such skills.

This package of evidence highlights the notion that self-beliefs and internalizations about the nature of cognitive processes impact important outcomes, possibly by altering the ways in which individuals interpret and select challenges, and through the subsequent selection and adjustment of the strategies they employ to tackle such challenges. The study of these phenomena has been limited primarily to adults, college students, and adolescents with little empirical research devoted to younger children. Indeed, some have argued that although young children can articulate their implicit theories, these seem to undergo significant change and development in early childhood and become more stable in adolescence. This is perhaps due to the nature of the academic environment inherent in the transition from elementary school to junior high school, which is marked by substantial changes to daily logistics, expectations of independence, and the social milieu (Blackwell, et al. 2007). Such jarring and impactful transitions occur in early life as well and provide all the more reason to understand how early life perceptions may shape small-scale learning and regulatory behaviors. The transition to Kindergarten from either preschool, regular center-based childcare, or no prior childcare experiences represents a period fraught with adjustments to new structures, schedules, rules, expectations for behavior, and social dynamics (Rimm-

Kaufman & Pianta, 2000). Understanding what children in this phase of life know about their abilities to control cognitive processes will inform the adults in their lives about how to encourage the acquisition of appropriate cognitive control strategies and when and how to use them.

Can Young Children Provide Stable Self-Reports of Cognitive Control?

Obtaining reliable, valid, and meaningful self-reports of abstract cognitive processes and abilities from young children is certainly a tall order. Capturing such information from young children requires the coordination of countless complex cognitive abilities including: adequate language skills to interpret interviewers' questions and produce interpretable answers, self-reflection skills, theory-of-mind, and autobiographical memory systems, to name a few. However, two major literatures – concerning developments in metacognition and self-concept -- offer evidence to suggest that reliable measures of abstract reflection can be obtained from young children.

While self-report measurement tools can be difficult to develop and problematic to interpret even among adult samples (e.g., Vazire, 2010), obtaining reliable and accurate self-reports of abstract cognitive processes and states from young children represents an even greater challenge. Indeed, early research into the self-reflective abilities of young children suggested that until the age of about 5, children have particular challenges reflecting on their own thought processes (Flavell, Green, & Flavell, 1995). However, recent converging evidence from the developmental metacognition and self-perception literatures suggest that it is possible to capture reliable self-reports of cognitive states, processes, and stable traits from young children and that this reflective knowledge importantly impacts behaviors.

Insights from metacognition and self-concept research. The field of metacognition research provides promising evidence that even very young children are able to make accurate reflections and reports of their own knowledge states and learning processes. The ability to actively reflect on one's mental processing and make necessary adjustments is clearly crucial to successful cognitive functioning and development. A series of recent studies suggests that children as young as preschool-age may be capable of accurately self-reporting on their metacognitive monitoring (Hembacher & Ghetti, 2014; Lyons & Ghetti, 2011; Lyons & Ghetti, 2013; Lipowski, Merriman, & Dunlowski, 2013) and, to a lesser extent, exercising appropriate strategic control processes (Destan, Hembacher, Ghetti, & Roebbers, 2014; Ghetti, Hembacher, & Coughlin, 2013; Lyons & Ghetti, 2013). In particular, one recent study suggested that children as young as elementary school age appear to be able to accurately monitor their own learning and knowledge states, but seem to struggle to execute effective control behaviors until late elementary school age (e.g., Roebbers, Krebs, & Roderer, 2014). Considering this evidence of developmental inconsonance between the reflections of such abstract cognitive processes as monitoring of learning and the subsequent control behaviors, a similar mismatch may be discovered with respect to children's ability to reflect and report on their cognitive control abilities and the apparent execution of such skills. Another body of metacognitive research has also shown that children aged three to five years can provide reports of metacognitive monitoring that, while overall more overly positive and optimistic than older children's, are still accurate with respect to their responses on test trials (for a review, see Ghetti, Hembacher, & Coughlin, 2013; Lyons & Ghetti, 2011; Lyons & Ghetti, 2013). This body of research illustrates that accurate

reflections of cognitive states and processes is necessary for fluent functioning and execution of relevant skills. A similar phenomenon may exist with respect to the reflection and deployment of cognitive control skills.

Perhaps the most promising evidence suggesting that children are capable of reflecting on and providing self-reports of their stable cognitive control skills and traits comes from the self-concept literature, a body of work that is distinct from the metacognition literature. Whereas the metacognition literature tracks children's ability to monitor knowledge states and ongoing learning processes, self-concept, as described previously in this review, is considered to represent one's reflections of stable characteristics and tendencies that is informed by past experiences, and is best measured as a hierarchy of multidimensional constructs (Bong & Skaalvik, 2003). Because self-concept is considered to reflect stable, global characteristics, its measurement seems most relevant to the present challenge of measuring young children's reflections of their stable cognitive control abilities.

Among older children, Marsh and colleagues have established that self-concept is multi-dimensional and hierarchical with correlations among the individual factors decreasing with age suggesting increasing differentiation as development progresses, (Marsh, Craven, & Debus, 1991; 1998). The extent to which the self-concepts of very young children exist, are measurable, and are similarly multidimensional has been the subject of some debate in the past decades.

Early attempts to measure children's self-concept suggested that children either did not have a stable multidimensional sense of self or could not adequately report on it (e.g., Harter, 1983; Harter, 1998; Howe & Courage, 1997). However, other researchers

have noted that these measurements often relied on open-ended questions that require young children to be capable of spontaneously generating the complex language needed to describe their conceptualizations of themselves (Eder & Mangesldorf, 1997). Efforts to reduce the amount of expressive language children need to generate in order to respond to items have yielded more promising results. For example, Harter and Pike (1984) created the Pictorial Scale of Perceived Competence and Social Acceptance in which children can view two cartoon pictures of gender-matched children portrayed as competent or incompetent at some task. Children are then asked which picture they most identify with. Factor analysis of this scale revealed that it only captured 2 discrete factors: social acceptance and general competence. However, later research suggested that the complex administration procedure, including both pictorial and verbal elements, might have contributed to confusion among the young participants (Fantuzzo, McDermott, Holliday Manz, Hampton, & Alvarez Burrdick, 1996). Indeed, later scale development revealed the possibility of uncovering more discrete dimensions of children's self-concept including those typically found in older child and adult samples (Marsh et al., 1991; 1998; Measelle, Ablow, Cowan & Cowan, 1998). For example, Marsh and colleagues (1991) adapted a pencil and paper version of their Self-Description Questionnaire for Adolescents to be administered as an individual interview that allowed for double-binary responses with children between the ages of 5 and 8 years. Results revealed that children's responses yielded multidimensional self-concepts with correlations among the factors decreasing in relation to age. These responses also showed substantial agreement with parent and teacher reports of similar constructs (Marsh et al., 1991; 1998). These

results provided important and compelling evidence that the structure and measurability of self-concept is similar in young children and adults.

Marsh and colleagues (2002) once again extended this administration format and similar items to even younger children, establishing that children as young as 4-5 years of age can provide reliable and differentiated reports of self-concept. The same forced-choice double binary response format was maintained. The factor structure revealed 6 distinct dimensions including Peers, Parents, Verbal, Math, Physical, and Appearance self-concepts with moderate correlations among these dimensions. Academic achievement test scores were significantly correlated with academic self-concept dimensions (Marsh, Ellis, & Craven, 2002). Recent research has further supported the external validity of this measure by demonstrating a strong link between math self-concept and math academic achievement scores (Arens et al., 2016).

Despite the success of these tools, young children tend to offer more self-referential disclosure, especially for emotionally charged content, through the use and manipulation of developmentally appropriate toys, dolls, and other props than when directly questioned by adults or when questioning relies on picture scales (Ceci & Bruck, 1993). Building on this evidence, Ablow and Measelle (1993) created the Berkeley Puppet Interview (BPI) to capture a wide range of young children's self-perceptions across many domains. In this method, experimenters engage with child participants by voicing two identical puppets that each represent one contrasting pole on a self-perception scale item and then asking children to indicate which one they identify with. For example Puppet 1 says, "I feel sad a lot", Puppet 2 then says, "I don't feel sad a lot", and finally the experimenter asks the child "How about you?" Rather than relying on

forced-choice responses, the scoring of the BPI uniquely allows for children to indicate their response to these prompts in a variety of developmentally appropriate ways, including stating the name of the puppet they identify with, pointing, providing other nonverbal responses, or offering qualifiers to responses, such as “I *sometimes* feel sad a lot.” Highly trained coders then score children’s interview responses with a 7-point Likert scale. Using this method, Measelle and colleagues (1998) found further support for a multidimensional self-concept in children as young as 4 years, 6 months including social competence and achievement motivation (Measelle et al., 1998).

Across a variety of measurement methods, this package of research demonstrates that early school age children have access to a stable sense of self that is hierarchical and is similarly reflected in the reports of close others. By minimizing the amount of spontaneous language young children must generate in order to convey their responses, capturing reflections of their cognitive control skills may be plausible. Specific methodological considerations are discussed next and the BPI is highlighted as a promising measurement tool for such an aim.

Methodological Considerations: Berkeley Puppet Interview as a Promising

Technique

Among the challenges associated with gathering self-reports from young children are language and attentional engagement constraints inherent in early life. More so than any other currently available technique for capturing children’s stable self-perceptions, the Berkeley Puppet Interview offers a methodology that reduces the barriers that both of

these challenges present. For this reason, it may be a promising technique for capturing the self-perceptions of cognitive control abilities of young children.

The Berkeley Puppet Interview, designed to capture self-perceptions of children aged 4- to 8-years old across many domains, places very few expressive language demands on children in order to respond to items, but uniquely allows for a variety of children's responses, whether verbal or nonverbal, to be coded according to a 7-point Likert scale (Ablow & Measelle, 1993; Measelle et al., 1998). This sensitivity, both in response domain and scoring, may offer the opportunity to capture any important, meaningful nuances in self-reports of cognitive control abilities - an as yet unmeasured construct. The use of puppets creates an engaging, comfortable, interactive environment for the child with the two pretend characters intended to match the child's age. For each item, one of the puppets embodies the positive characteristic and the other embodies the negative characteristic, thus making it less socially and emotionally aversive for the child to choose to identify with the less socially desirable characteristic as a 'peer' has already self-disclosed the same characteristic (Ablow & Measelle, 1993). The BPI's flexible coding scheme and facilitation of an unself-conscious interaction with puppets make it a method that is particularly well-suited for research requiring that children provide reports of internal states that may otherwise be less apparent or available to the adults in their lives including depression and anxiety (Measelle et al., 1998), psychiatric symptomatology and emotional distress (Ablow et al., 1999) perceptions of parents' marital conflict (Ablow, Measelle, Cowan, & Cowan, 2009), reflections of parent-child relationships (Sessa, Avenevoli, Steinberg, & Morris, 2001), and internalizing behaviors (Stone et al., 2013). As children's self-reports of their cognitive control abilities have not

yet been measured, empirical evidence is as yet unavailable in relation to whether these reports will converge with parent reports of relevant observable behaviors and behavioral assessments. However, cognitive control abilities most likely manifest behaviors that are stable and observable by others, so a lack of correspondence between child self-reports via BPI-style interview and parent reports may very well be interpreted as children's inability to adequately reflect or report on these skills. Discovering such an inability to report these skills would be meaningful for the field of children's self-perceptions of cognitive processes and stable traits, especially in light of the substantial amount of evidence described herein that even young children are capable of self-reporting on similar constructs.

The BPI has also been successfully employed to elicit young children's self-reports of behaviors that are considered to be more readily available and observable by teachers and parents including academic and social competence, achievement motivation (Measelle et al., 1998), and personality traits (Measelle et al., 2005). These studies provide compelling evidence that children as young as 4 years can provide stable self-reports of their cognitive and behavioral functioning in school, as well as differentiated personality traits that tend to coincide with reports of relevant behaviors from the adults in their lives. These examples of successful uses of the Berkeley Puppet Interview, combined with its developmentally sensitive and flexible administration and scoring protocol, make the prospect of capturing children's self-reports of cognitive control abilities via a similar method quite promising.

Dissertation Aim

For this dissertation project, I developed and validated a self-report interview scale that captures young children's self-perceptions and awareness of their own cognitive control skills. The scope of this dissertation included two phases: (1) Scale item development, interview data collection in a museum setting, and; (2) a second wave of interview data collection that also included lab-based tasks and additional parent reports, reliability analyses, and initial validation analyses. This interview scale was designed to capture young children's self-perceptions of cognitive control abilities with a specific emphasis on children making the transition to formal elementary school settings. Due to the exploratory nature of this initial study, a relatively wide range of ages was included. Children between 4- and 7-years-old were eligible to participate. Prior research administering interview items of similar content and complexity using the BPI method has shown that children as young as age 4 can respond reliably (Measelle et al., 1998; Measelle et al., 2005). Although it is reasonable to assume that older children would be able to provide stable and reliable reports of cognitive control abilities, the puppet interview format may appeal more to a younger age group.

The dissertation addresses three main research questions: (1) Does the developed scale yield reliable self-reports of children's perceptions of their cognitive control abilities via a puppet interview format?; (2) Will these self-reports correspond to parent reports of similar traits and abilities?; and (3) Will these self-reports correspond to performance on behavioral lab tasks that require similar skills?

Data collected in the two phases were used to address each of these questions. Children's responses to the interview scale were analyzed using a principal components

analysis to assess the reliability of the self-reports and the internal structure of the items in the scale. Initial validation efforts were made by investigating the extent to which children's self-reports of cognitive control abilities correlate with well-validated parent reports of such skills and lab tasks that measure similar abilities. Specifically, a Multi-Trait, Multi-Method Matrix analysis was employed to assess evidence of both convergent and discriminant validity (Campbell & Fiske, 1959). This analysis compares correlations across tasks that capture similar and different traits (e.g., cognitive control and extraversion) using similar and different methodologies (e.g., puppet interview self-report and behavioral lab task). This allows for the evaluation of correlations that are likely to share variance due to administration method and those that are likely to share variance due to constructs to establish possible patterns of validity for the new scale.

Prior evidence described herein suggests that children at these young ages are quite capable of engaging in complex metacognitive processes (e.g., Ghetti, Hembacher, & Coughlin, 2013) and reporting on stable traits (e.g., Marsh et al., 2002) and support the following hypotheses: (1) Children's responses to the BPI-CC scale will be reliable and consistent, reflecting coherent reports of perceptions of cognitive control abilities. While this scale is predicted to capture a single construct, responses may also cluster around multiple correlated, but separable coherent constructs such as one component capturing Memory and Attention and another capturing Emotion Regulation; (2) Children's scale responses will be correlated with parent reports of children's cognitive control; and (3) BPI-CC scale responses will also be correlated with performance on lab tasks capturing executive function and attention regulation skills.

CHAPTER II

METHODS

Phase 1: Scale Development & Initial Data Collection

Scale Concept. This interview scale was developed and administered as a subscale of the Berkeley Puppet Interview (Ablow & Measelle, 1993; Measelle et al., 1998; Measelle et al., 2005). As described earlier, in this method, experimenters engage with child participants by voicing two identical puppets that each represents one contrasting pole on a self-perception scale item and then asking children to indicate the one with which they identify. This methodology moves beyond forced-choice responses and allows children to make their responses known in a variety of developmentally appropriate ways that may be explicit or subtle. These responses are coded with a 7-point Likert scale from the videotaped interviews by highly trained coders. As such, for the current scale, each item reflected a specific aspect of cognitive control for which the two puppets reflected extreme anchors and children were encouraged to respond in such a manner as to indicate their level of agreement on a continuum.

Item Development Procedure. To begin to develop an interview scale that captures self-awareness of cognitive control, I first outlined the specific qualities and constructs that constitute cognitive control in young children. As described in the introduction, I define cognitive control to be those cognitive abilities involved in monitoring, regulating, and adapting information and behavior in service of goals. Although countless cognitive processes and mechanisms are conceivably involved in such complex mental activity, for this purpose I considered the following constructs to be central to cognitive control: inhibition, self-regulation and emotion-regulation, memory,

planning, attention-modulation, and delay of gratification. As such, the scale items assessed children's perceptions of their own embodiment of these traits. Although cognitive control is defined here as being composed of several individually defined constructs, I expected responses to a scale capturing cognitive control in this age group to be fairly uni-dimensional and that the scale's internal structure would reflect that. As has been demonstrated in developmental research into executive function, this trait may differentiate more with age and multiple factors may be apparent in older age groups (Lerner & Lonigan, 2014). However, separable, but correlated, components may emerge reflecting responses to items capturing Attention Modulation/Memory as well as one capturing Emotion Regulation. A principal components analysis was conducted to investigate the internal structure of response items and whether such components may in fact be separable and the extent to which they may be correlated.

In order to generate a set of possible items that captures the full extent of these skills, I began with a list of other widely used and validated measures that assess similar traits and created items that reflect relevant behaviors and abilities. These included parent and teacher report instruments as well as lab-based behavioral assessments of executive function and self-regulation. For example, I consulted the Behavior Rating Inventory of Executive Function - Preschool Version (BRIEF-P, Gioia, Andrews, & Isquith, 1996), a parent or teacher report of children's executive function abilities. For the item "Is fidgety, restless, or squirmy," I generated the potential item "I usually have a hard time sitting still." Similarly, for the BRIEF-P item "Has trouble changing activities" I generated the potential item "When it's time to stop playing and do something else, I don't want to."

Next, I considered a battery of commonly used direct behavioral assessments of executive function and self-regulation, including Stroop-like assessments of inhibitory control like Grass/Snow, Day/Night, and Gift Delay, as well as the marshmallow test of delay of gratification and the Dimensional Change Card Sort Task and created items that directly asked children about the behaviors and skills exhibited in such tasks. For example, “I’m good at waiting for fun stuff” and “When my parents give me instructions, it’s hard for me to remember all of them at once.”

Once a list of items had been generated from the described procedures, I consulted the defining characteristics to ensure that all aspects of cognitive control had been captured and added items accordingly, including “I think carefully about how someone will feel before I say something to them” and “I’m good at focusing on my work when other kids are being noisy or bad” and “When I get really angry at someone, sometimes I’ll hit them.”

This procedure yielded 26 items. These items were then sent to colleagues for feedback regarding the scale items. These colleagues include Dr. Dare Baldwin, Dr. Louis Moses, and Dr. Jeffrey Measelle, each of whom has particular expertise in early childhood cognitive development and the development and self-reporting of cognitive control skill. Feedback on item structure, content, comprehensiveness, and clarity was incorporated and problematic items were re-written, re-structured, or eliminated. See Appendix A for a full list of items.

Phase 1 Data Collection Procedure. The University of Oregon shares a collaborative relationship with the local children’s science museum, The Science Factory, in which the museum invites researchers from the university to conduct brief studies with

families on the exhibit floor during their visits to the museum. Upon entering the museum, the experimenter approached families with children in the target age range and asked if they were interested in hearing about the opportunity to participate in a brief study investigating children's cognitive abilities. If families were interested in the study, the experimenter obtained informed consent from the child's parent and brought them to a semi-private research area within the museum exhibit area. Parents were asked to complete the Parent Form – Cognitive Control – a paper-and-pencil version of the BPI scale that asks parents to respond to the same items that are asked of their child. See Appendix D for the full list of these items. The participants were seated in an interview area along with the experimenter who voiced the two identical puppets. After a brief warm-up, the experimenter conducted the subscale of items with the participant using the format described earlier in the *Scale Concept* section. These interview sessions were videotaped for offline coding. The entire length of the study, including the parent questionnaires and the child interview lasted no longer than 10 minutes. 43 children aged 4- through 7-years and their families were recruited to participate in the museum-based data collection in Phase 1.

Phase 2: Validation Data Collection

In Phase 2, I continued to collect additional interview data using the BPI-CC scale described in Phase 1 and also collected data with other instruments designed to address questions of convergent and discriminant validity for the scale. To establish such evidence, I planned a Multitrait-Multimethod Matrix analysis to examine possible associations between scores on the BPI-Cognitive Control scale and a) scores on other

well-validated measures of similar constructs that use the same measurement method (i.e., the BPI Big 5 Conscientiousness subscale) and different methods (i.e., parent reports on the BRIEF, or lab tasks measuring executive functioning), as well as b) other related, but distinct constructs of interest measured using the same method as the BPI-CC scale (i.e., BPI Big 5 Extraversion subscale) and different methods (i.e., CSUS). 83 children in the same age range as in Phase 1, 4- through 7-years old, were recruited to participate in the Phase 2 lab-based study. Participant families were recruited through the Developmental Database – a Psychology department -wide shared resource, which includes a list of families with children in the Eugene area. Families were contacted via phone and email and invited to participate in a single 1-hour visit to the lab space on the University of Oregon campus. Children were compensated for their participation with their choice of a children’s book or a t-shirt.

Materials

Child Measures

BPI Cognitive Control Scale (BPI-CC): This consists of the finalized item list resulting from Phase 1’s scale development procedure. This scale was administered using the Berkeley Puppet Interview Method described earlier, and in the same manner as in Phase 1 Data Collection. Appendix A shows the full list of initial items. Appendices B and C show the items comprising the two subscales that resulted from scale refinement analysis.

BPI Big-5 Personality Factors: Using the traditional Berkeley Puppet Interview format, this set of 41 items comprises five subscales assessing young children’s

personality traits on the Big-5 factors including, Conscientiousness, Agreeableness, Extraversion, Neuroticism, and Openness (Measelle et al., 2005). See Appendix G for a full list of items by subscale.

NIH Toolbox, Early Childhood Cognition Measures: The NIH Toolbox Early Childhood Cognition Measures consists of a battery of well-validated measures of executive functioning skills for children between the ages of 3-7 years. The battery includes a Toolbox Picture Vocabulary Test (Verbal IQ), Flanker Task (Attention/Inhibition; test-retest ICC = .92), List Sorting Task (Working Memory; test-retest ICC = .78), and the Dimensional Change Card Sort Task (Task Switching/Shifting; test-retest ICC = .92). Each of these tasks takes between 2-7 minutes to complete, were administered via the NIH Toolbox iPad application, and are described in detail in the following sections (Bauer & Zelazo, 2013). *Toolbox Picture Vocabulary Test:* The TPVT is an adaptive test in which children are shown four images on the iPad screen as a word is said aloud. Children are instructed to touch the image that matches the word that was said. Correct answers are followed by increasingly challenging trials and incorrect answers are followed by easier trials. This adaptive trial succession yields a standardized theta score, representing the participant's performance relative to the entire population of participants across the lifespan. *List Sorting Task:* Working memory ability was assessed using a list-sorting task in which participants were shown images of animals or foods one at a time in pseudo-random order and asked to repeat the images they saw in order of size. If participants answered at least one trial correctly, they would advance to the second round after completing the first round. If they did not answer any trials correctly in the first round, the task ended and they received a raw score of zero. If participants did

answer at least one trial correctly, round one trials would continue until they answered two trials in a row incorrectly, at which point they were advanced to the next round in which animals and foods were presented in the same trials. In this round, participants were asked to restate the foods they saw in size order, followed by the animals they saw in size order. Once participants answered two trials in a row incorrectly, the task ended. Scores were based on the number of trials answered correctly. *Flanker Task:* Attentional control was measured using a modified flanker task in which children are shown a line of five fish facing all the same direction (congruent) or one in which the middle fish is facing a different direction than the four flanking fish (incongruent). For each trial, participants are asked to press a button indicating which direction the middle fish is pointing. Participants who answer accurately on at least 90% of trials with no more than one error on congruent trials and one error on incongruent trials advanced to the next round in which the same procedure is followed except arrows are presented in place of fish. Participants who are less than 80% accurate on all trials receive a score based solely on accuracy. Those who are more than 80% accurate on all trials also receive a response time score that is combined with an accuracy score. *Dimensional Change Card Sort Task:* In this task, participants are familiarized with a matching game in which a center image can be matched with one of two response images based on color or shape. After these familiarization trials, participants are then given a series of practice trials that follow the same rules as the familiarization trials, but use different shapes and colors. They then advance to the test trials in which the word “color” prompts participants to match based on the center image’s color or the word “shape” prompts the participants to match the center image based on its shape. As in the flanker task, if participants fail to

reach the 80% accuracy threshold, raw scores are based solely on accuracy. If participants surpass the accuracy threshold, their raw scores will also include a response time component.

Head-Toes-Knees-Shoulders (HTKS): This task is a measure of inhibitory control and takes about 4 minutes to complete. Children are first oriented to a version of the game in which they simply follow instructions from the researcher like “Touch your head” or “Touch your toes.” Then children are instructed to do the opposite. When the researcher says “Touch your head” children are to touch their toes. A series of practice trials are given with feedback until the child understands the rules. Additional rules are added in to increase complexity as the game goes on until a ceiling rule is reached or all 40 items are completed. Test-retest of the HTKS is .93 and correlates with the Child Behavior Rating Scale .29, (McClelland & Cameron, 2012). See Appendix H for the full procedure.

Parent Measures

Parent Form – Cognitive Control (Parent Form – CC): This form is a paper-and-pencil version of the newly developed BPI scale which asks parents to answer the same items that are asked of their child regarding their cognitive control skills. Parents respond to each item on a 7-point Likert scale. See Appendix D for the full list of 26 items adapted for parents and Appendices E and F for the subscales that resulted from the scale analysis.

Behavioral Rating Inventory of Executive Function (BRIEF): This parent report tool captures parent’s assessments of their child’s executive function skills with subscales measuring behavior, emotion, and cognitive regulation abilities. Two versions

of this form were used in this research. The BRIEF-P is validated for use with children between the ages of 2 years and 5 years, 11 months. The BRIEF is valid for use with children between the ages of 5 years and 18 years. For this project, the BRIEF-P was administered to parents whose children were 4-years-old or 5-years-old and not yet enrolled in Kindergarten. The BRIEF was administered to parents whose children were 5-years-old and enrolled in Kindergarten or were 6-years-old or older. Internal consistency estimates are typically above .8 for both the BRIEF and BRIEF-P. Test-retest reliabilities are typically .82 for the BRIEF and .78 or higher for BRIEF-P, (BRIEF-P, Gioia et al., 1996 and BRIEF, Gioia, Isquith, Guy, & Kenworthy, 2000). See Appendix K for the full list of items on the BRIEF-P and Appendix L for the BRIEF items.

Children's Behavior Questionnaire- Short Form (CBQ): The CBQ Short Form is a questionnaire measuring the parent or teacher's perception of a child's skills in fifteen areas: Activity Level, Anger/Frustration, Approach/Positive Anticipation, Attentional Focusing, Discomfort, Falling Reactivity/Soothability, Fear, High Intensity Pleasure, Impulsivity, Inhibitory Control, Low Intensity Pleasure, Perceptual Sensitivity, Sadness, Shyness, and Smiling/Laughter. Teachers/Parents rate how like each item is to their child on a 1-7 Likert scale. Test- retest reliabilities range from .63 to .82 and correlations with measures of social skills and problem behaviors range from .44 to -.60, (Putnam & Rothbart, 2006). See Appendix I for the full CBQ-Short Form scale.

Children's Social Understanding Scale (CSUS): The CSUS is a parent questionnaire assessing children's theory of mind development in early childhood. Internal consistency estimates are quite strong, $\alpha = .90$, and scores correlate moderately with composite scores on lab tasks of theory of mind, $r = .39$ (Tahiroglu et al., 2014). See

Appendix J for the full CSUS scale items.

Demographics Questionnaire: This questionnaire captures ethnicity, race, income, and education level for any and all parents or legal guardians of the child. In addition to these standard demographics questions, the questionnaire also asks parents whether their child or any of the child's siblings or parents have been diagnosed with ADHD, ASD, Developmental Delay, or experienced birth complications. See Appendix M for the full set of demographics questions.

Phase 2 Data Collection Procedure. Upon arrival at the lab, the experimenter guided parents and children into a small testing room where she described the study details and obtained informed consent from the parent and assent from the child participant. As part of the consent procedure, parents were informed that their child would be videotaped during the study. Once parents had agreed and signed the consent forms, children were asked if they assented to participation and video recording, and if affirmed, the video recorder was turned on. While children completed the interview and lab tasks, parents were directed to a small area in the testing room behind a screen where they were asked to complete the questionnaires described above. Parents were also told at this time that if they felt uncomfortable at any time or wished to stop, they were free to stand up and ask to take a break or stop the study entirely. Children were offered compensation of a book or t-shirt regardless of completion of all tasks.

After a brief warm-up period with a few toys in the study room, the experimenter, seated on the floor, introduced children to two identical puppets named Iggy and Ziggy. At this point, the experimenter voiced Iggy and Ziggy to complete the BPI Cognitive Control Scale items and the first half of the Big-5 Personality Interview using the BPI

technique of having one puppet endorse one extreme anchor of the item and the other puppet endorse the other extreme anchor, followed by asking participants to indicate how they identified. Halfway through the entire list of items, the experimenter told the children, via the puppets, that it was time to take a break. Children were then instructed to play the Head-Toes-Knees-Shoulders game in which the HTKS task was completed. Following the HTKS task, the interview was resumed and the remaining items were administered. The entire administration of all BPI items and the HTKS task took an average of 20-30 minutes to complete.

Following the second half of the interview, the puppets were put away and children were invited to play a series of games via the NIH Toolbox application on an iPad at the table with the experimenter. Each brief assessment of executive functioning and self-regulation lasted approximately 3-7 minutes and followed in rapid succession. Each task was administered via iPad. The experimenter explained the instructions and completed practice trials until children were ready to complete the tasks on their own. Immediately following the battery of NIH Toolbox tasks, the experiment was concluded and participants were awarded their choice of a children's book or t-shirt as compensation.

Interview Coding. All interviews from both Phase 1 and 2 were coded and scored from video by two coders who previously completed several rounds of intensive coding training with Dr. Jeffrey Measelle and me. Coders were given a series of practice videos to code separately. Correlations between coders surpassed stringent reliability thresholds at $r = .92$ and 93% absolute agreement on training videos. These highly trained research assistants scored children's responses to interview items by judging verbal and non-

verbal responses including pointing, facial affect, and body language. These responses were then assigned a score on a 7-point Likert scale.

CHAPTER III

RESULTS

Demographics

126 children between 4- and 7- years of age ($M = 69.35$ months; 61 female, see Table 1 for demographics breakdown) and their families participated in this study. 43 of these families participated during Phase 1 data collection at the children's museum and 83 participated in the longer Phase 2 lab-based study. Data from one of the families from the lab-based collection phase was excluded because the child refused to complete the tasks early on in the session. 78 of the families participating in the lab-based data collection phase completed a demographics questionnaire. 44% of those families reported an annual household income of over \$70,000, 21% between \$50,000 and \$70,000, and 23% between \$10,000 and \$30,000, with 6% preferring not to answer. 96% identified their race as Caucasian, 92% identified as Not Hispanic or Latino, 3% identified their ethnicity as Hispanic or Latino, and 5% of families preferred not to answer. Parents also reported their education level with 26% completing some college, but no degree, 15% held associates degrees, 24% held bachelor's degrees, 22% had masters degrees, and 14% held a doctorate or professional degree.

Table 1.

Age and Gender of Child Participants, Collapsed Across Data Collection Phases.

Age	F	M	Totals
4 <i>54.68 (4.09)</i>	20	18	38
5 <i>63.85 (4.35)</i>	18	16	34
6 <i>78.31 (3.98)</i>	10	18	28
7 <i>89.07 (3.66)</i>	13	12	25
Totals	61	64	125

Note. Mean ages in months within each group are presented in italics and standard deviations are presented in parentheses.

Data Analysis Plan

Because the interview data collection for this project took place in two very different contexts -- a brief study in a noisy, public museum in Phase 1 and at the beginning of a longer series of lab tasks in a quiet, private lab space in Phase 2 -- preliminary scale mean comparisons across these two datasets were conducted, revealing that interview and parent form responses did not significantly differ across the two contexts, (all $ps > .704$). Thus, the data from the two phases were combined for all scale reliability and validity analyses reported here.

To evaluate the reliability of the newly developed BPI-CC scale, a preliminary scale analysis investigating the internal structure of the scale was conducted using principal components analysis (PCA) and internal consistency estimates. In addition to evaluating the structure and reliability of the child scale, similar analyses were also conducted with parents' responses to the Parent Form – CC.

The scale analysis procedures yielded refined final scale items for both the child BPI-CC scale and the Parent Form – CC scale as well as corresponding subscales for each. Age and gender effects were evaluated by computing independent samples t-tests, one-way ANOVAs and post-hoc comparisons. The refined scales and subscales were then used in the subsequent validation analyses. To estimate validity, the new scales and subscales were used to compute correlations with lab tasks measuring components of executive function, parent reports of their children's cognitive control and other related constructs, as well as children's self-reports of other traits. These correlations were then arranged in a Multi-Trait Multi-Method Matrix in order to evaluate the scales' potential convergent and discriminant validity (Campbell & Fiske, 1959).

Scale Analysis

A total of 125 child participants from both data collection phases completed the Berkeley Puppet Interview – Cognitive Control items. A pair of highly trained research assistants coded each interview. Inter-rater reliability was measured using the intraclass correlation coefficient from a two-way random effects model estimating an average measure. Reliability estimates were quite high for each individual item, (all ICCs > .91), and for the entire scale, ICC = .99. There were very little missing data across each item with most items showing 0% missing data and ranging up to 4.8%. Participants' individual scale means were imputed into any missing data points. The internal consistency estimate of the full initial set of 26 items after means were imputed was strong, $\alpha = .78$.

Scale refinement. Three individual items with corrected item-total correlations below .2, and three other items with no inter-item correlations above .3, were removed. These adjustments yielded a slightly higher internal consistency estimate, $\alpha = .81$. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy for the resulting 19-item set was .75, which meets Kaiser's classification of 'Middling' to 'Meritorious' (Kaiser, 1976). This test assesses the extent to which the items share linear relationships. All items' individual KMO values reached acceptable levels, except one (.53), which was removed from the analysis along with another item with which it was solely correlated. These refinements yielded a 17 item scale with $\alpha = .81$ and a statistically significant Bartlett's test of sphericity ($p < .001$), suggesting the data were appropriate for a PCA to explore possible separable components of cognitive control captured by the scale.

Component analysis. Because any possible separable components captured by the scale items are likely to be correlated, a PCA with an oblique Direct Oblimin rotation was conducted to allow for such covariance. This analysis showed that six of the initial components had eigenvalues greater than one. These components explained 25.47%, 10.39%, 7.47%, 7.27%, 6.45%, and 5.90%, respectively, for a total of 62.93% variance explained by all six. Visual inspection of the scree plot (see Figure 1), however, suggests the existence of two primary components, as the inflection point in the line graph is clearly demarcated at component three (Cattell, 1966). A two-component solution explained 35.85% of the variance and also fit with the *a priori* hypothesis that two primary constructs within cognitive control might emerge. The Direct Oblimin rotated solution with a forced two-component extraction also yielded ‘simple structure’ such that items tended to load strongly on only one of the two correlated components. The 7 items loading on Component 1 tended to capture attention modulation and memory abilities, such as “I have a hard time paying attention,” and will be referred to as the BPI Attention Modulation (BPI-AM) subscale henceforth. This subscale had moderate internal consistency, $\alpha = .68$. The 10 items loading on Component 2 tended to capture self- and emotion-regulation abilities including “I’m not good at waiting for fun stuff,” and will be referred to as the BPI Self-Regulation (BPI-SR) subscale. This subscale had stronger internal consistency, $\alpha = .78$. See Table 2 for item loadings on each component and communalities for the two-component rotated solution. See Appendices B and C for final subscale items. Children’s mean composite BPI-AM subscale scores and BPI-SR subscale scores were significantly positively correlated, $r(123) = .46, p < .001$.

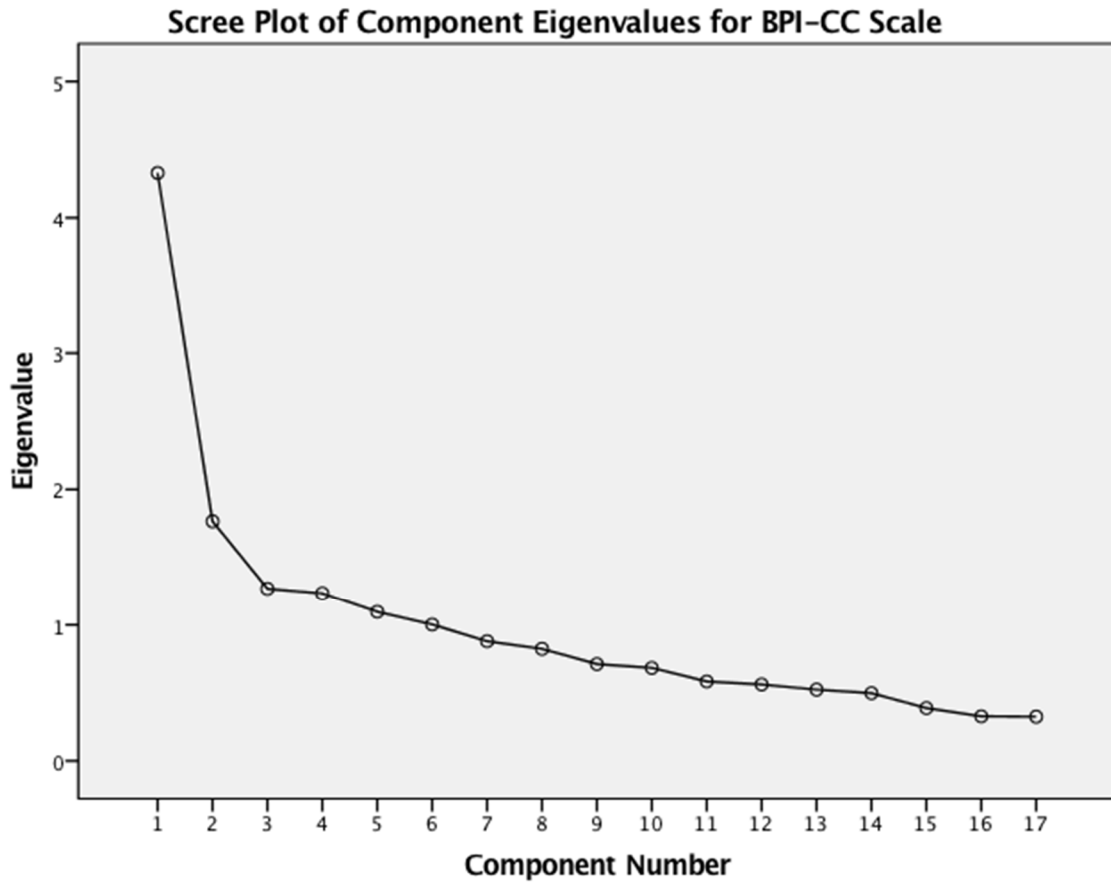


Figure 1. Eigenvalues extracted in a Direct Oblimin rotation PCA of 17 BPI-CC items indicating the existence of two separable components.

Table 2.

Rotated Pattern Matrix for a PCA of BPI-CC Interview Scale Extracting Two Components.

Items	Rotated Component Coefficients		
	Component 1	Component 2	Communalities
24	0.771	-0.055	0.571
18	0.696	-0.120	0.446
23	0.598	0.086	0.397
16	0.573	0.053	0.351
21	0.570	-0.139	0.295
15	0.547	-0.003	0.298
22	0.475	0.357	0.459
20	0.451	0.059	0.223
10	0.396	0.310	0.330
26	0.369	0.249	0.256
7	-0.253	0.683	0.422
12	-0.019	0.676	0.450
25	-0.097	0.643	0.383
19	0.088	0.587	0.385
8	0.184	0.516	0.360
4	0.115	0.425	0.225
5	0.214	0.384	0.245

Note. Primary component loadings presented here in bold.

Parent Form. 125 parents also completed the Parent Form version of the scale (Parent Form – CC). Internal consistency of responses to the full set of 26 items on the Parent Form was high, $\alpha = .90$. One item was removed due to a low corrected item-total correlation ($r < .3$) and lack of correlations with other items in the scale. With this item removed, a PCA revealed six eigenvalues greater than one, but a Scree Plot (see Figure 2) suggested three potential components. However, a forced three-component extraction with Direct Oblimin rotation did not yield simple structure or an interpretable solution. A two-component solution showed relatively simple structure; however, two items were shown to load relatively weakly on both components and were removed. A PCA with

those items removed yielded simple structure and highly interpretable components that roughly mirrored those of the child scale – Attention-Modulation and Self-Regulation (Parent Form – AM; Parent Form – SR, respectively). See Table 3 for final factor loadings and communalities for the two-component solution. Internal consistencies for the full Parent Form - CC scale, as well as the two Parent Form – AM and Parent Form - SR subscales were strong, $\alpha = .89$, $\alpha = .85$, $\alpha = .83$, respectively. See Appendices E and F for the final scale and subscale items.

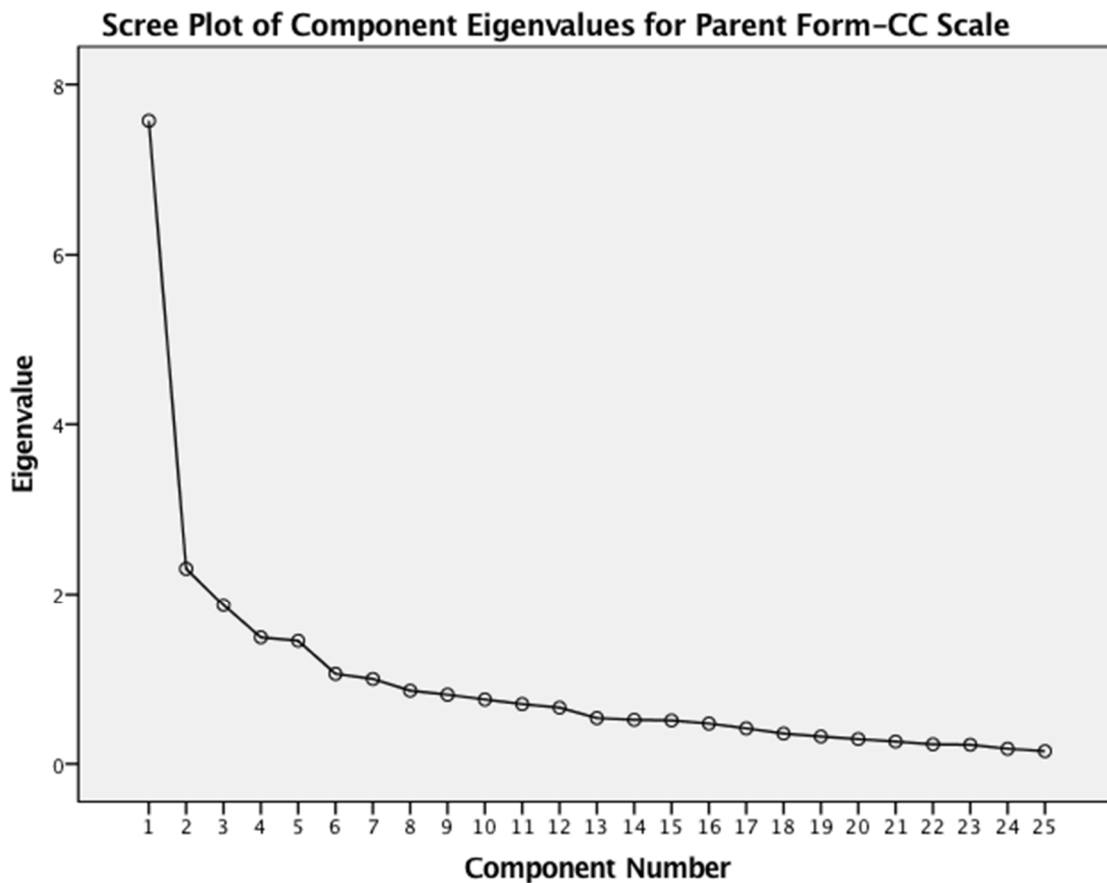


Figure 2: Scree plot of Eigenvalues per component for Parent Form – CC suggesting three primary components with 25 items.

Table 3.

Rotated Pattern Matrix for a PCA of The Parent Form Scale.

Items	Rotated Component Coefficients		
	Component 1	Component 2	Communalities
6	0.738	0.109	0.494
20	0.692	-0.141	0.575
15	0.665	-0.169	0.558
2	0.664	0.228	0.375
14	0.639	0.171	0.353
24	0.599	-0.195	0.488
18	0.576	-0.083	0.375
13	0.563	-0.083	0.361
5	0.500	-0.001	0.250
17	0.485	-0.274	0.414
11	0.451	-0.272	0.373
3	0.326	-0.159	0.171
4	0.323	-0.212	0.360
8	-0.145	-0.807	0.582
12	0.031	-0.761	0.599
25	-0.0154	-0.702	0.432
10	-0.049	-0.682	0.442
26	0.091	-0.656	0.484
19	0.144	-0.600	0.448
22	0.134	-0.592	0.430
9	0.188	-0.465	0.319
7	0.054	-0.442	0.217
1	0.053	-0.395	0.175

Scale and Subscale Descriptive Statistics

Child Interview Scale. Mean scores on the refined BPI-CC scale and the two subscales across age groups are presented in Table 4. Overall, mean scores for each of these scales were slightly above average with all means greater than four, the middle point on the Likert scale. Scores on the two subscales were significantly, positively correlated, $r(123) = .46, p < .001$. Comparisons across gender revealed no significant

mean gender differences for any of the three child self-report scales, (all $t_s < .37$, $p_s > .715$). Age in months was significantly negatively correlated with the full BPI-CC scale $r(123) = -.21$, $p = .022$. However this seemed to be driven by a significant negative correlation between age and the BPI-SR subscale, $r(123) = -.35$, $p < .001$. Age was not correlated with the BPI-AM subscale, $r(123) = -.06$, $p = .528$. Similarly, omnibus one-way ANOVAs comparing scale and subscale means across age revealed a significant difference among age groups on the BPI-SR scale $F(3,121) = 4.39$, $p = .006$, but no significant age differences for the full BPI-CC scale or the BPI-AM subscale, $p = .22$, $p = .659$, respectively. Differences across age groups on the BPI-SR fit a significant linear trend, $F(3,121) = 11.94$, $p = .001$. Interestingly, *post-hoc* group comparisons of the BPI-SR sub-scale revealed that children tended to report less self-regulation skill with increasing age. This pattern, illustrated in Figure 3, was primarily driven by differences between 4-year-olds and 6-year olds, $p = .071$, between 4-year-olds and 7-year olds, $p = .021$ and between 5-year-olds and 7-year-olds, $p = .05$. These puzzling results are addressed later.

Similarly, verbal ability, as assessed by the NIH Toolbox Picture Vocabulary Task, was significantly negatively correlated with scores on the BPI-CC full scale, $r(80) = -.32$, $p = .004$, and the BPI-SR subscale, $r(80) = -.40$, $p < .001$, and only marginally with the BPI-AM subscale, $r(80) = -.19$, $p = .086$.

Table 4.

Means and Standard Deviations for BPI-CC Scale and Subscales and Parent Form-CC Scale and Subscales.

Scale	4-Year-Olds	5-Year-Olds	6-Year-Olds	7-Year-Olds	Totals
BPI-CC	4.72 (.92)	4.65 (.76)	4.32 (1.08)	4.44 (.77)	4.57 (.89)
BPI-SR	4.93 (1.02)	4.85 (.79)	4.31 (1.15)	4.17 (1.05)	4.62 (1.04)
BPI-AM	4.63 (1.11)	4.51 (.97)	4.33 (1.19)	4.63 (.89)	4.53 (1.05)
PF-CC	4.13 (.87)	4.32 (.87)	4.36 (.89)	4.73 (.89)	4.35 (.90)
PF-SR	3.92 (1.11)	4.10 (1.08)	4.24 (.95)	4.50 (1.22)	4.16 (1.10)
PF-AM	4.29 (.96)	4.49 (.96)	4.45 (1.03)	4.91 (.91)	4.50 (.98)

Note. Standard deviations presented in parentheses. Scores for each scale and subscale averaged across age groups are presented in bold in the Totals column.

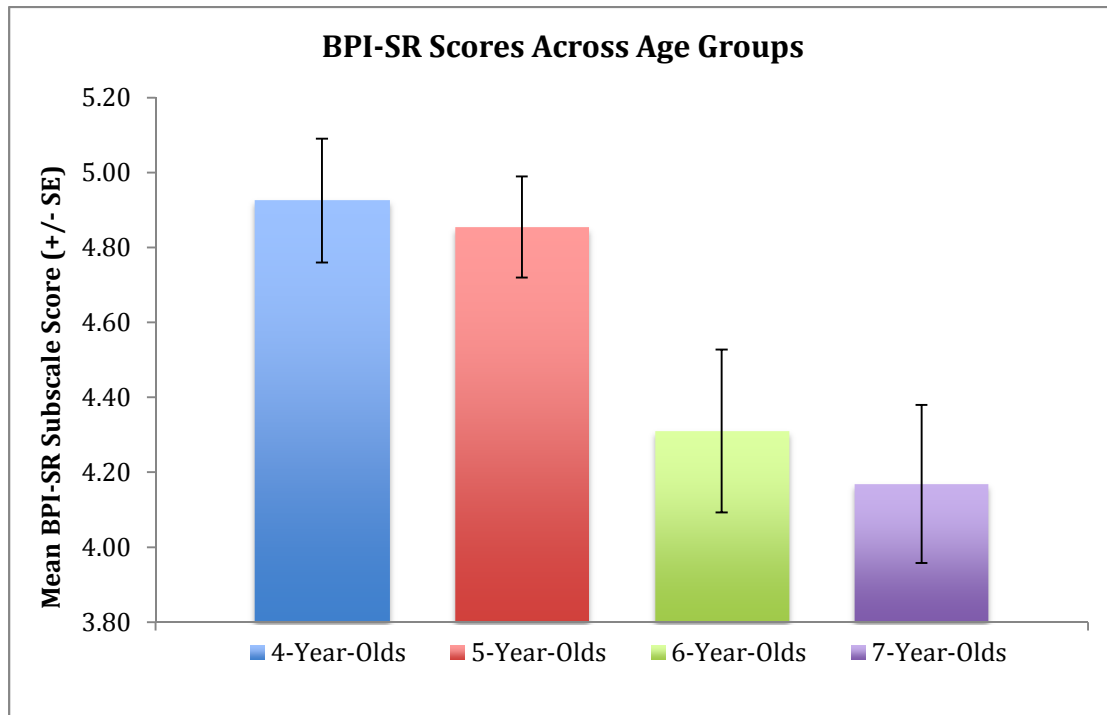


Figure 3. Mean BPI-SR subscale scores across age groups. Error bars represent the standard error for each age group.

Parent Form Scale. Table 4 also presents mean scale and subscale scores across age groups for the Parent Form versions. As was the case for the child interview scales, means for the scale and subscales collapsed across age were all greater than four, suggesting above-average parent ratings of their children's cognitive control. The two Parent Form subscales were also significantly positively correlated, $r(123) = .52, p < .001$. Unlike the child interview scales, comparisons across genders did reveal significant differences in parents' mean cognitive control ratings for girls and boys. Independent *t*-tests revealed that on average, parents rated girls higher ($M = 4.52, SD = .92$) than boys ($M = 4.19, SD = .87$) on the full, refined Parent Form-CC scale reflecting greater parental perception of cognitive control for girls, $t(123) = 2.07, p = .041$. This gender difference on the full-scale scores seemed to be primarily driven by a gender difference on the Parent Form – SR subscale in which parents rated girls higher ($M = 4.42, SD = 1.14$) than boys ($M = 3.90, SD = 1.00$), $t(123) = 2.72, p = .007$. There was no difference across genders on the Parent Form – AM subscale, $t(123) = 1.04, p = .301$. One-way ANOVAs revealed marginal differences and significant linear trends across age groups for both the Parent Form – CC scale, $F(3,121) = 2.37, p = .074, F(1,121) = 6.65, p = .011$, and the Parent Form-AM subscale, $F(3,121) = 2.15, p = .097, F(1,121) = 5.41, p = .022$, but no significant age differences were present for the Parent Form – SR subscale, $p = .216$. However, the pattern of age differences for the full scale and the BPI-AM subscale was opposite to the pattern that emerged for the child interview BPI-SR subscale. As shown in Table 4, means for the Parent Form scales tended to increase with age. *Post-hoc* comparisons revealed that the marginally significant omnibus ANOVAs for the full Parent Form – CC scale and Parent Form – AM subscale were driven by a single

significant difference between 4-year-olds and 7-year olds, $p = .044$, and a marginally significant difference between the same groups, $p = .064$, respectively. See Figure 4.

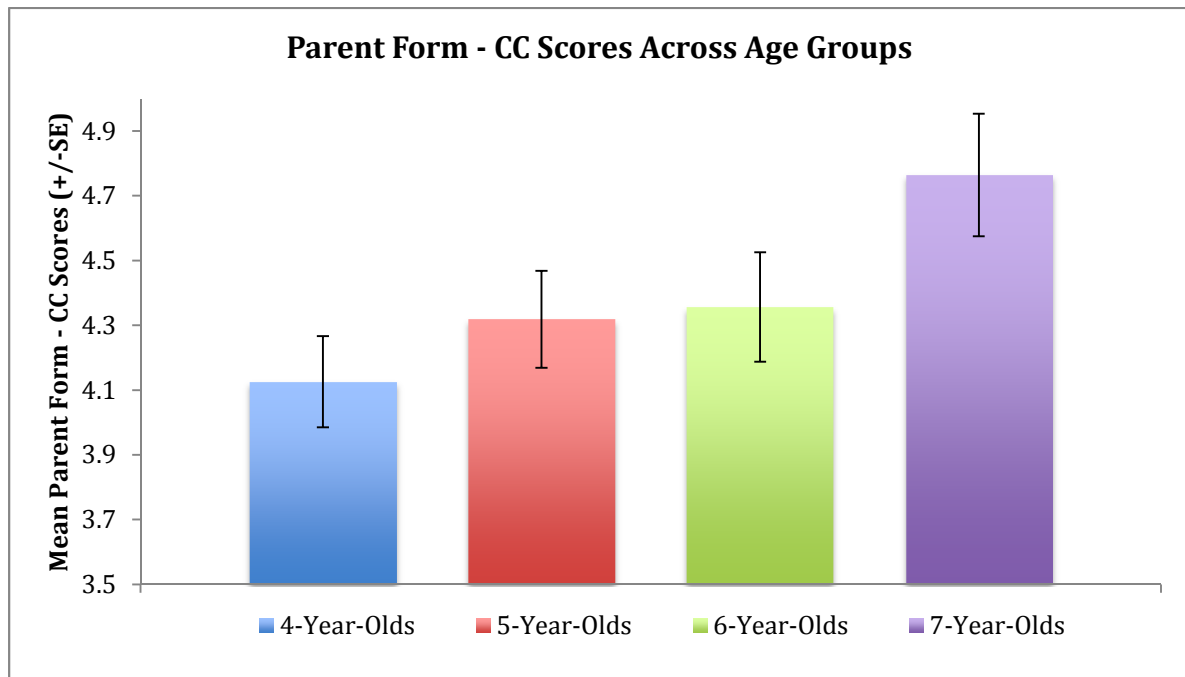


Figure 4. Mean Parent Form-CC scale scores across age groups. Error bars represent the standard error for each age group.

Validation Analyses

Multitrait-Multimethod Matrix Analysis. A multitrait-multimethod analysis allows for the systematic comparison of correlations among measures that share variance due to measurement method, construct similarity, or both, with the aim of establishing patterns of convergent and discriminant validity for certain measures (Campbell & Fiske, 1959). The logic of this analysis stems from the notion that measures of related psychological constructs captured using similar methodologies will share the most variance (both construct and method variance) and thus should have the strongest correlations. Dissimilar constructs measured using different methodologies should share

little variance and are likely to have the weakest correlations. Measures of dissimilar constructs using the same methods and measures of similar constructs using different methods should both show correlations somewhere in the middle. Table 5 shows a full multitrait-multi-method matrix for this analysis.

For this global analysis, responses to both the Parent Form-CC and children's BPI-CC full refined scales were correlated with a number of measures meant to indicate convergent or discriminant validity. Measures included in this analysis that might indicate convergent validity included two of children's self-reported Big-5 personality factors most closely related to cognitive control (Conscientiousness and Neuroticism), a composite Executive Functioning score composed of the mean of standardized Working Memory, Flanker, Card Sort, and HTKS scores, the BRIEF parent report composite score, and a composite CBQ Effortful Control score comprising scores on four of the CBQ subscales: Attentional Focus, Inhibitory Control, Low-Intensity Pleasure, and Perceptual Sensitivity. Two measures of constructs unrelated to cognitive control were included to indicate discriminant validity: Parent reports of children's social understanding via the CSUS, and children's self-reports of Extraversion.

According to Campbell and Fiske (1959), convergent validity is marked by correlations between measures of similar constructs measured using different methods that are significantly different from zero. In this analysis, convergent validity can be evaluated by examining correlations between BPI-CC, the Parent Form – CC, the two previously validated composite parent-report measures of cognitive control (BRIEF Composite, CBQ Effortful Control) as well as the composite EF score. First, parents' responses to the refined Parent Form-CC items were moderately positively correlated

with children's responses to the refined BPI-CC items, $r(123) = .24, p = .008$. Similarly, results also revealed a moderate correlation between BPI-CC scores and the BRIEF Composite score, $r(69) = .27, p = .022$. Taken together, these two findings suggest that children's self-reports of cognitive control skills via the BPI-CC corresponded with parents' accounts of their children's skills, providing some evidence of convergent validity. However, BPI-CC scores were not significantly related to parent's reports on the CBQ-Effortful Control composite score, suggesting this relationship might not be robust and should be further investigated.

Similarly, correlations between both of the previously validated aggregated parent report measures and the Big-5 Conscientiousness subscale – measuring a construct similar to cognitive control and also captured using the BPI method – were not significant, suggesting that the correlations between the aggregated parent report measures and the BPI-CC could be attributed to shared construct variance.

The BPI-CC scale did not correlate significantly with the composite score representing performance on the four lab tasks measuring executive functioning. This could be interpreted as a lack of evidence of convergent validity for the BPI-CC. However, the composite lab task scores were only significantly correlated with the BRIEF and CBQ Effortful Control composite parent report scores when age and verbal ability were controlled. Fine grained analyses investigating the specific relations between parent and child reports of cognitive control and behavioral task scores will be undertaken to more deeply understand these patterns. It is plausible that the lab tasks did not function well for measurement purposes in the present research. For example, children's performances on the list-sorting task measuring working memory capacity

showed a floor effect. It may be that this task is not appropriate for capturing variance in working memory among children in this age range. However, the composite behavioral task score was significantly correlated with age $r(80) = .78, p < .001$ and children's self-reports of Conscientiousness, $r(70) = .36, p = .002$, suggesting these tasks are functioning as expected. Alternatively, it could be the case that the BPI-CC captured meaningful abilities that are unrelated to those demonstrated through the specific lab tasks measuring executive functioning that were utilized here.

Finally, a multitrait- multimethod analysis highlights correlations that might be inflated due to shared method variance rather than shared construct variance. As described earlier, the BPI-CC showed strong positive correlations with all three of the Big-5 personality factor subscales. Correlations with Conscientiousness, $r(70) = .45, p < .001$, and Neuroticism, $r(70) = .53, p < .001$, traits more closely aligned with cognitive control, were higher than with Extraversion, $r(70) = .31, p = .007$. This may illustrate that the Big-5 subscales shared substantial method variance with the BPI-CC as they were administered via the same unique interview technique, but the fact that correlations with Conscientiousness and Neuroticism were stronger provides possible evidence of meaningful shared construct variance.

Scale reliability estimates were quite high for both the new BPI-CC and Parent Form-CC scales as well as the other measures included in the analysis. Nevertheless, adjusted correlations that take into account the reliability of each measure represented in the correlation can provide estimates of the true correlations between constructs if measures were free of any error variance. To compute these adjustments for attenuation, the raw correlation between two measures is divided by the square root of the product of

the two measures' reliability estimates. As such, when correlations among these global composite measures were corrected for attenuation due to estimates of each measure's reliability, the overall patterns of results did not change. Overall, the global analyses just described suggested that children's reports of their cognitive control abilities are meaningfully differentiated from their self-reports of other traits, and correspond to their parents' views of those skills to at least some degree. However, this analysis also suggested that these self-reports of cognitive control may not map onto behavioral measures of such skills. Correlational patterns among the BPI-CC, the Parent Form-CC, their subscales, and other measures of cognitive control will be explored in finer detail in what follows.

Table 5.

Multitrait-Multimethod Matrix Assessing Validity of BPI-CC Scale

Task	BPI-CC	PF-CC	EF	CBQ-EC	BRIEF	Big5 Consc	Big5 Neuro	Big5 Extra	CSUS
BPI-CC	1								
PF-CC	.24** (.29)** .32**	1							
EF	-.13 (.06) .15	.29** (.23)* .21†	1						
CBQ-EC	.10 (.12) .13	.60** (.60)** .60**	.21† (.24)* .24*	1					
BRIEF	.27* (.26)* .26**	.61** (.63)** .63**	.10 (.23)† .25*	.45** (.46)** .46**	1				
Big5 Consc.	.45** (.53)** .55**	.23* (.20)† .20	.36** (.29)* .29*	.13 (.12) .12	.15 (.17) .17	1			
Big5 Neuro	.53** (.53)** .55**	.14 (.16) .16	.08 (.22)† .23†	-.06 (-.06) -.06	.15 (.15) .15	.47** (.51)** .51**	1		
Big5 Extra	.31** (.33)** .311**	.13 (.13) .14	.04 (.04) .08	.04 (.04) .04	.10 (.10) .10	.32** (.32)** .33**	.40** (.41)** .51**	1	
CSUS	-.06 (.04) .05	.38** (.34)** .34**	.48** (.18) .18	.49** (.52)** .52**	.27* (.35)** .35**	.12 (.00) .00	-.06 (-.03) -.03	.08 (.08) .08	1

Note. Partial correlations controlling for age are shown in parentheses. Partial correlations controlling for both age and verbal ability are shown in italics. † $p < .10$, * $p < .05$, ** $p < .01$ (2-tailed).

Correlations Between Child Interview Scale and Parent Form. Although the revised Parent Form – CC, BPI – CC, and their corresponding subscales, ultimately included different numbers and combinations of items, correlations across the two versions of these scales were moderate and positive suggesting a fair amount of agreement between parents and children on children’s cognitive control skills $r(123) = .24, p = .008$. Raw, age-controlled, and age and verbal ability-controlled correlations across the two versions of the scale and subscales appear in Table 6. The correlation remained significant even when variance due to age was controlled, $r(122) = .26, p = .001$. The BPI-SR scores correlated moderately with the Parent Form – SR scores $r(123) = .22, p = .015$, and remained correlated when age was controlled for in a partial correlation, $r(122) = .29, p = .001$, but was nonsignificantly correlated with the Parent Form – AM, $r(123) = .14, p = .119$. Similarly, the BPI-AM scores showed correspondence with their Parent Form counterparts, $r(123) = .19, p = .039$, which remained significant when age was controlled, $r(122) = .20, p = .027$. However, the BPI-AM was only marginally significantly correlated with the Parent Form – SR subscale $r(123) = .17, p = .055$, which became significant when age was controlled $r(122) = .18, p = .041$. Correlational patterns did not change when verbal ability was controlled for in addition to age (see Table 6). These correlational patterns indicate that not only do children’s perceptions of their own cognitive control abilities as captured by the BPI-CC scale tend to correspond with parent reports of children’s overall cognitive control abilities, they also tend to agree reasonably well regarding specific, separable components of children’s cognitive control skills. This agreement was also present even when children’s age and verbal abilities were controlled.

Table 6.

Raw, Age-Corrected, and Age/Verbal Controlled Correlations Between BPI-CC and Parent Form Scales and Subscales

	BPI-CC	BPI-SR	BPI-AM	PF-CC	PF-SR	PF-AM
BPI-CC	1					
BPI-SR	--	1				
BPI-AM	--	.46** (.47)** .44**	1			
PF-CC	.24** (.29)** .32**	.20* (.29)** .32**	.21* (.22)* .24*	1		
PF-SR	.22* (.26)** .27*	.22* (.29)** .30**	.17† (.18)* .19†	--	1	
PF-AM	.19* (.24)** .28*	.14 (.22)* .25*	.19* (.20)* .23*	--	.52** (.51)** .52**	1

Note. Partial correlations controlling for age are shown in parentheses. Partial correlations controlling for both age and verbal ability are shown in italics. † $p < .10$, * $p < .05$, ** $p < .01$ (2-tailed).

BPI-CC Correlations with Parent Reports of Related Constructs. Because two different versions of the BRIEF scale needed to be administered for children of different ages, scores on this measure were computed to allow for comparison and collapse across age groups. Thus, only items that were identical across the two versions within any one subscale were included in any of the scoring and analyses of the subscales and the BRIEF Composite score. This scoring system yielded scores for the following subscales and item

counts: Inhibition (six items), Shifting (five items), Emotion Control (six items), and Working Memory (nine items). Although Planning and Organization is a subscale shared across the two versions of the BRIEF, the two versions did not share any identical items, so this subscale was not included in these analyses. The BRIEF composite score for each participant was computed by averaging all 26 items across each subscale. Finally, all items were reverse-coded for interpretability such that higher scores on the subscales and BRIEF composite indicated higher functioning on those skills. The CBQ-Short Form comprises 15 subscales of six items each. Only four of these subscales comprise the previously validated composite score for Effortful Control used in the global analysis reported earlier: Attentional Focus, Inhibitory Control, Low-Intensity Pleasure, and Perceptual Sensitivity. In addition to these subscales, Activity Level, Anger and Frustration, Soothability, and Impulsivity subscales were included in this detailed analysis due to their apparent relevance to cognitive control. All CBQ subscales were scored such that higher scores indicated more of that trait. Finally, the CSUS Long Form comprises six subscales with seven items each and a total score averaged across all items such that higher scores indicate stronger social understanding. Only the CSUS total score was included in these analyses. Means and standard deviations for each of these scales appear in Table 7.

Table 7.

Means and Standard Deviations for CBQ Subscales and BRIEF Composite Scores

CBQ Subscales								BRIEF	CSUS
Act. Level	Anger Frust.	Atten. Focus	Sooth	Impulse	Inhib. Cont.	Low-Int. Pleasure	Percep. Sens.	Composite	Total
4.65 (1.04)	4.20 (.94)	4.96 (1.04)	4.56 (1.02)	4.12 (.86)	4.81 (1.04)	5.81 (.82)	5.48 (.86)	2.35 (.25)	3.38 (.30)

Note. Standard deviations are shown in parentheses.

Independent *t*-tests revealed no significant differences across genders in how parents rated their children on any of these parent-report measures, (all *ps* > .05). Only the CBQ Inhibitory Control subscale and the CSUS Total score were significantly correlated with age, $r(76) = .24, p = .033$, and $r(76) = .48, p < .001$, respectively. Similarly, one-way ANOVAs revealed no significant differences in parents' ratings among age groups for any of the CBQ subscales or the BRIEF Composite score, (all *ps* > .05). However a one-way ANOVA comparing CSUS scores across age groups revealed a significant age effect, such that parents' ratings of their children's social understanding increased with age, $F(3,74) = 7.50, p < .001$.

Correlational analyses, reported in Table 8, revealed that both the BPI-CC full scale and BPI-SR subscale shared moderate, negative correlations with the CBQ Anger and Frustration subscale, such that children who reported lower cognitive control abilities (and lower self-regulation abilities) tended to score higher on parent-reported levels of Anger and Frustration, $r(76) = -.29, p = .011$, and $r(76) = -.31, p = .005$, respectively. This correlation was marginally significant for the BPI-AM subscale, $r(76) = -.21, p = .066$. These patterns remained when age was controlled, $r(75) = -.29, p = .011$, and $r(75) = -.33, p = .004$, $r(76) = -.21, p = .069$, respectively. CBQ Soothability scores were moderately positively correlated with BPI-SR scores such that children who self-reported stronger self-regulation abilities tended to have higher parent reported Soothability scores, $r(76) = .24, p = .034$, and this correlation was slightly attenuated when age was controlled, but remained in the same direction, $r(75) = .20, p = .084$. CBQ Soothability scores were not significantly correlated with the BPI-CC full scale or the BPI-AM

subscale, $ps > .10$. CBQ Inhibitory Control scores were only marginally significantly correlated with BPI-SR subscale scores when age was controlled, $r(75) = .20, p = .075$, but were not correlated with either the BPI-CC full scale or the BPI-AM subscale, $ps > .10$. None of the three BPI scores were significantly correlated with CBQ scores for Activity Level, Attentional Focus, Low-Intensity Pleasure, Perceptual Sensitivity, or Impulsivity, all $ps > .10$. None of the four individual subscales that comprised the CBQ Effortful Control composite score were related to the BPI-CC or subscales, which is also reflected in the global analysis reported earlier. Nevertheless, two additional subscales, parent reports of children's Anger and Frustration and Soothability, did show some correspondence with children's own reports of cognitive control.

BRIEF Composite scores were significantly positively correlated with the BPI-CC full scale, BPI-SR subscale, and the BPI-AM subscale such that children who self-reported higher cognitive control skills had higher parent-reported executive function composite scores, $r(69) = .27, p = .022$; $r(69) = .24, p = .041$; $r(69) = .24, p = .044$, respectively. These correlations held even when age was controlled, $r(68) = .26, p = .028$; $r(68) = .24, p = .05$; $r(68) = .24, p = .048$. Finally, the three BPI scales were not significantly correlated with the CSUS total score, all $ps > .10$.

Correlational patterns and strengths between BPI-CC scales and subscales and all parent report measures did not change substantially when verbal ability was controlled in addition to age (See Table 8).

Table 8.

Raw, Age-Controlled, and Age/Verbal Controlled Correlations Between BPI-CC Scale/Subscale Scores and Parent Reports

Parent Report	Full BPI-CC	BPI-SR	BPI-AM
CBQ Activity Level	-.05 (-.05) <i>-.05</i>	-.05 (-.04) <i>-.04</i>	-.04 (-.04) <i>-.04</i>
CBQ Anger Frustr	-.29* (-.29)* <i>-.32**</i>	-.31** (-.33)** <i>-.35**</i>	-.21† (-.21) † <i>-.23*</i>
CBQ Attn Focus	.07 (.11) <i>.12</i>	.00 (.07) <i>.08</i>	.10 (.11) <i>.12</i>
CBQ Soothability	.18 (.16) <i>.13</i>	.24* (.20) † <i>.18</i>	.11 (.10) <i>.08</i>
CBQ Impulsivity	-.03 (-.01) <i>-.00</i>	-.07 (-.04) <i>-.03</i>	.01 (.01) <i>.02</i>
CBQ Inhib Control	.12 (.18) <i>.16</i>	.10 (.20) † <i>.18</i>	.11 (.13) <i>.11</i>
CBQ Low-Intensity	.05 (.03) <i>.07</i>	.02 (-.01) <i>.02</i>	.06 (.06) <i>.09</i>
Percep. Sensitivity	.08 (.05) <i>.07</i>	.04 (-.01) <i>.01</i>	.09 (.08) <i>.10</i>
BRIEF Composite	.27* (.26)* <i>-.27*</i>	.24* (.24)* <i>-.24*</i>	.24* (.24)* <i>-.24*</i>
CSUS Total	-.06 (.04) <i>.05</i>	-.16 (.01) <i>.01</i>	.02 (.06) <i>.06</i>

Note. Correlations with CBQ subscales and CSUS Total are based on N = 78; correlations with BRIEF Composite are based on N = 71. A selection of CBQ subscales relevant to cognitive control is presented here. Partial correlations controlling for age are shown in parentheses. Partial correlations controlling for age and verbal ability are shown in italics. † $p < .10$, * $p < .05$, ** $p < .01$ (2-tailed).

BPI-CC Correlations with EF Tasks. Participants in the lab-based data collection phase completed a series of NIH Toolbox tasks, administered via iPad, that assessed verbal ability and components of executive function, (Bauer & Zelazo, 2013). Means and

standard deviations across age groups are presented in Table 9. Verbal ability was assessed using the Toolbox Picture Vocabulary Test (TPVT). This adaptive task yields standardized theta scores representing the participants' performance compared to the entire population of participants who have completed the task, regardless of age. Hence, many of the child participants' theta scores are negative, as expected. Nevertheless, the distribution of theta scores within this sample was normal.

Table 9.

Means and Standard Deviations for EF Lab Tasks by Age Group

Task	4-Year-Olds N=21	5-Year-Olds N=19	6-Year-Olds N=23	7-Year-Olds N=18	Totals N=81
TPVT	-3.68 (1.22)	-2.26 (1.58)	-1.31 (1.55)	-.26 (1.28)	-1.93 (1.88)
WM	1.19 (2.25)	4.74 (5.16)	11.00 (5.66)	15.06 (2.44)	7.89 (6.77)
Flanker	50.38 (14.75)	66.53 (16.95)	70.96 (18.19)	79.83 (13.17)	66.56 (18.99)
DCCS	62.43 (16.32)	69.33 (16.59)	79.30 (15.70)	84.17 (17.51)	73.73 (18.26)
HTKS	21.73 (14.76)	36.47 (16.56)	47.61 (11.10)	53.28 (6.31)	39.33 (17.55)

Note. Standard deviations presented in parentheses. Scores for each task averaged across age groups are presented in bold in the Totals column. TPVT = Toolbox Picture Vocabulary Test, uncorrected standardized scores; WM = Raw Working Memory scores; Flanker = Flanker, uncorrected standardized scores; DCCS = Dimensional Change Card Sort, uncorrected standardized scores; HTKS = Raw Head-Toes-Knees-Shoulders scores.

A list-sorting task assessed working memory. Scores for this task were based on the number of trials answered correctly. Many children in the sample did not advance beyond the practice trials, thus scoring a zero on the task. Scores of zero are not given a standardized score, thus raw scores for the working memory task are included in the analyses here to account for this floor effect.

Attentional control was measured using a modified flanker task. Scores were computed based on accuracy and response time. Participants who were less than 80% accurate on all trials did not receive a response time score and those who were more than 80% accurate on all trials received a score based on both accuracy and response time. The resulting raw scores could then be interpreted as higher scores indicating stronger attentional control. The raw scores were then translated into a standardized score uncorrected for age with a mean of 100. A large portion of participants, 21% or 17 children, did not reach the accuracy threshold and, thus, did not receive a score based on response time, resulting in a mildly bimodal distribution.

Finally, task switching or shifting was measured using the NIH Toolbox version of the Dimensional Change Card Sort Task. As in the Flanker task, raw scores are computed based on accuracy and, if an accuracy threshold is met, response time. Scores are then standardized, but uncorrected for age, with a mean of 100. As was the case for Flanker task scores, 18% of participants (15 children) failed to reach the accuracy threshold, again resulting in a slightly bimodal distribution of scores.

In addition to these NIH Toolbox tasks administered via iPad, children also participated in the Head-Toes-Knees-Shoulders task assessing a combination of executive skills including inhibitory control and working memory (McClelland & Cameron, 2012). Final scores reflect the total number of correct trials. Scores on this task were more normally distributed, but showed a slight ceiling effect.

As expected, considering none of the raw or standardized task scores were corrected for age, all four tasks were significantly positively correlated with age (all $r_s > .48$, $p_s < .001$) and one-way ANOVAs showed that scores on all four of the NIH Toolbox

tasks monotonically improved with increasing age, all $F_s > 7.00$, $p_s < .001$. Gender differences emerged only for the dimensional change card sort task with girls ($M = 77.80$, $SD = 13.48$) outperforming boys ($M = 69.44$, $SD = 21.57$), $t(78) = 2.09$, $p = .04$. In order to investigate developmental effects on these lab tasks, standardized scores that are uncorrected for age are included in the analyses throughout, with the exception of the use of raw working memory scores to account for the floor effect, and raw HTKS scores due to the unavailability of normed data. However, an investigation of the age-corrected standardized scores (including the working memory scores), which have means of 100 and standard deviations of 15, shows that participants' performance on these tasks was quite typical, (M_s range from 99.48 – 103.96, SD_s , from 12.79 – 16.79). However, participants' performance on the verbal ability task was quite strong with a mean more than one standard deviation above the normed average, ($M = 116.77$, $SD = 15.59$).

The global analyses reported earlier showed that children's BPI-CC scores were not significantly correlated with a composite EF score that was computed by averaging standardized scores for working memory, flanker, card sort, and HTKS tasks. Here correlations among the scale, subscales, and individual lab tasks are reported. Raw, age controlled, and age and verbal ability controlled correlations among the BPI-CC scales and lab tasks are presented in Table 10. The BPI-CC full scale, BPI-SR, and BPI-AM subscales were all moderately negatively correlated with verbal ability scores, $r(79) = -.32$, $p = .004$; $r(79) = -.40$, $p < .001$; $r(79) = -.19$, $p = .086$, respectively. These correlations attenuated just slightly when controlling for age, $r(79) = -.25$, $p = .025$; $r(79) = -.23$, $p < .039$; $r(79) = -.21$, $p = .057$. These correlational patterns paradoxically

suggested that children with greater verbal ability also tended to report having fewer cognitive control skills.

The BPI-CC full scale and BPI-SR subscale were also both negatively correlated with scores on the list sorting working memory task, $r(79) = -.20, p = .073$; $r(79) = -.33, p = .002$; however, those correlations dropped to almost zero and fell below significance when controlling for age, $r(78) = -.06, p = .603$; $r(78) = -.09, p = .412$. Similarly, the raw correlation between the BPI-SR subscale and HTKS scores was negative and significant, $r(80) = -.24, p = .03$, but fell to zero when age was controlled, $r(79) = .00, p = .944$. No significant correlations emerged between the BPI-CC scale and subscales and the Flanker or DCCS tasks, all $ps > .10$.

The global analyses showed that responses to the Parent Form-CC were significantly positively correlated with the composite EF score, but that this relationship was attenuated and fell below significance when age and verbal ability were controlled. Correlations between the Parent Form-CC full scale, subscales and EF tasks were also all nonsignificant when controlling for age, except positive correlations between the HTKS and the Parent Form – CC full scale and the Parent Form – AM, $r(79) = .25, p = .026$; $r(79) = .26, p = .019$, respectively.

Despite strong negative correlations between the BPI-CC scale and BPI-SR subscale and verbal ability scores, controlling for verbal ability in addition to age did not change the patterns of correlations among scale scores and lab tasks (See Table 10).

Table 10.

Raw, Age-Controlled, and Age/Verbal Controlled Correlations Between BPI-CC Scale/Subscale Scores and Lab Tasks

Task	Full BPI-CC	BPI-SR	BPI-AM
Verbal Ability	-.32** (-.25)*	-.40** (-.23)*	-.19† (-.21) †
List Sorting	-.20† (-.06) <i>.02</i>	-.33** (-.09) <i>-.02</i>	-.06 (-.03) <i>.05</i>
Flanker	-.03 (.10) <i>.15</i>	-.11 (.10) <i>.14</i>	.04 (.08) <i>.12</i>
Card Sort	-.10 (-.00) <i>.02</i>	-.18 (-.02) <i>.01</i>	-.02 (.01) <i>.03</i>
HTKS	-.10 (.07) <i>.15</i>	-.24* (.01) † <i>.08</i>	.02 (.09) <i>.16</i>

Note. Partial correlations controlling for age are shown in parentheses. Partial correlations controlling for both age and verbal ability are shown in italics. † $p < .10$, * $p < .05$, ** $p < .01$ (2-tailed).

BPI-CC Correlations with other Child Self-Reports. In addition to completing the BPI-CC scale in the Berkeley Puppet Interview format, participants also answered 41 items assessing the Big 5 personality factors via the same interview format (Measelle et al., 2005). Items were scored in the same way as the BPI-CC scale, by the same two trained coders who watched the interviews on video and translated children's answers into a score according to a 7-point Likert scale. Higher scores indicate higher levels of that particular trait. Inter-rater reliability across the entire Big 5 scale, assessed with the intraclass correlation coefficient, was quite high, ICC = .99. For this analysis, three of the Big 5 personality factors assessed were included due to their relevance to the construct of cognitive control: Conscientiousness, Neuroticism (most closely mirroring cognitive control and self- and emotion-regulation), and Extraversion (predicted to be fairly unrelated to cognitive control). Eight items comprise the Conscientiousness subscale,

eight items comprise the Neuroticism subscale, and nine items comprise the Extraversion subscale. Means and standard deviations for these three subscales across age groups are presented in Table 11.

Table 11.

Means and Standard Deviations for Child Self-Reported Big-5 Traits

Big-5 Trait	4-Year-Olds N=19	5-Year-Olds N=19	6-Year-Olds N=21	7-Year-Olds N=13	Totals N=72
Conscientiousness	4.88 (.57)	5.27 (.71)	5.31 (.67)	5.45 (.51)	5.21 (.65)
Neuroticism	5.10 (.98)	5.61 (.51)	5.21 (.95)	5.29 (.78)	5.30 (.84)
Extraversion	4.89 (.80)	4.83 (.92)	4.92 (.81)	4.96 (.91)	4.90 (.84)

Note. Standard deviations presented in parentheses. Scores for each trait subscale averaged across age groups are presented in bold in the Totals column.

Scores on each of the three Big 5 subscales did not differ across genders, all $ps > .10$. One-way ANOVAs revealed no significant age differences for Neuroticism and Extraversion, $ps > .10$, but a marginally significant effect of age for scores on the Conscientiousness subscale, $F(3,68) = 2.60, p = .059$. These age differences fit a linear trend such that self-reported Conscientiousness scores tended to increase with age, $F(1,68) = 2.40, p = .016$, and post-hoc comparisons suggested this age effect was driven by a marginally significant difference between 4-year-olds and 7-year-olds, $p = .07$ (see Figure 6). Interestingly, although marginal, this pattern was in the opposite direction to the age differences seen in the BPI-SR subscale, where older children tended to report lower self-regulation skills than younger children.

Correlations among the BPI-CC scale means and the three Big 5 personality subscale means are presented in Table 12. As expected, correlations between the BPI-CC

full scale, BPI-SR subscale, and BPI-AM subscale and Conscientiousness were quite strong and positive, $r(70) = .45, p < .001$; $r(70) = .33, p < .001$; $r(70) = .45, p < .001$, respectively, and these became stronger when controlling for age, $r(69) = .53, p < .001$; $r(69) = .45, p < .001$; $r(69) = .48, p < .001$. Neuroticism scores were similarly strongly and positively correlated with BPI-CC scale and sub-scale scores, $r(70) = .53, p < .001$; $r(70) = .46, p < .001$; $r(70) = .47, p < .001$, and remained so when age was partialled out, $r(69) = .53, p < .001$; $r(69) = .46, p < .001$; $r(69) = .47, p < .001$. Correlations between the BPI-CC scale/subscales and Extraversion were also positive, but weaker than the other two traits, $r(70) = .31, p = .007$; $r(70) = .30, p = .011$; $r(70) = .26, p = .025$, and remained when controlling for age, $r(69) = .33, p = .006$; $r(69) = .33, p = .026$; $r(69) = .27, p = .026$. Because the Big 5 personality factors and the BPI-CC scale were each administered using the same interview methodology, moderate to strong correlations across these subscales were expected to showcase shared method variance in addition to any covariance among constructs being measured. In that regard, it is noteworthy that scores on the Parent Form – CC scale and the Parent Form – SR subscale were also positively correlated with Conscientiousness scores, $r(70) = .23, p = .048$; $r(70) = .25, p = .036$, respectively, and fell just below significance when controlling for age, $r(69) = .20, p = .099$; $r(69) = .22, p = .067$. Parent Form scales were not significantly correlated with either Neuroticism or Extraversion scores, $ps > .10$

Table 12.

Raw, Age-Controlled, and Age/Verbal Controlled Correlations Between BPI-CC Scale/Subscale Scores and Other Child Self-Reports

Task	Full BPI-CC	BPI-SR	BPI-AM
Conscientiousness	.45** (.53)** .55**	.33** (.45)** .47**	.45** (.48)** .49**
Neuroticism	.53** (.53)** .55**	.46** (.46)** .48**	.47** (.47)** .48**
Extraversion	.31** (.33)** .31**	.30* (.33)** .31**	.26* (.27)* .25*

Note. Partial correlations controlling for age are shown in parentheses. Partial correlations controlling for both age and verbal ability are shown in italics. † $p < .10$, * $p < .05$, ** $p < .01$ (2-tailed).

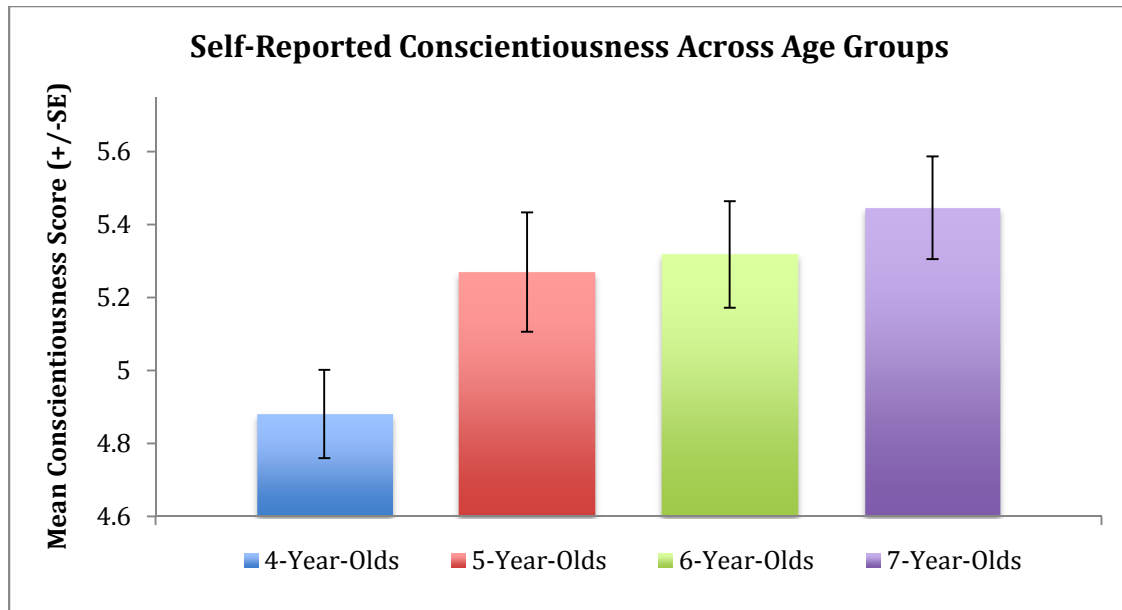


Figure 6. Children's self-reported Conscientiousness subscale scores across age groups. Error bars represent the standard error for each age group.

CHAPTER IV

DISCUSSION

Summary of Findings

This study provides early and encouraging evidence that young children are capable of providing reliable and consistent self-reports of their own cognitive control, and that these self-reports show substantial correspondence with parent reports of the same or similar constructs. Despite agreement between parents and children about children's cognitive control skills, however, neither parent reports nor child self-reports showed consistent or substantial correspondence with lab tasks measuring executive functioning. Finally, children's responses to the BPI-SR subscale items showed an interesting age-related pattern – in which children tended to report lower levels of cognitive control with increasing age – that should be investigated further in future research. Research questions and specific hypotheses are revisited in detail in the following sections.

Research Question and Hypothesis 1. The first question guiding the research concerned whether the developed scale yields reliable self-reports of children's perceptions of their cognitive control abilities via a puppet interview format. I hypothesized that children's responses to the BPI-CC scale would be reliable, consistent, and reflect coherent reports of perceptions of their cognitive control abilities. Previous metacognition and self-concept research has demonstrated that even preschool-aged children are capable of reliably reporting stable perceptions of themselves, their knowledge states, and their cognitive processes (e.g., Hembacher & Ghetti, 2014; Lyons & Ghetti, 2011; Marsh et al. 2002; Measelle et al., 2005). However, this new scale aims

to measure the extent to which children can specifically report on cognitive-control skills – a constellation of cognitive processes and abilities not yet measured through self-report in young children. Following initial scale refinement procedures, internal consistency estimates suggested the refined 17-item BPI-CC scale elicited responses from children showing strong reliability and consistency with an overall alpha estimated at $\alpha = .81$. I also hypothesized that the scale would capture a single construct, cognitive control, but that responses might also cluster around multiple correlated, but separable constructs. The constructs that I hypothesized might emerge were a Memory and Attention component and another component capturing Self- and Emotion-Regulation, as previous research has demonstrated that “cool” and “hot” executive functioning skills have been shown to be only moderately correlated among young children, (e.g. Zelazo & Carlson, 2012). Children’s responses also provided support for this hypothesis; in particular, a principal components analysis suggested that a two-component solution best fit the data. The two components that emerged were moderately correlated ($r = .31$) and tended to fit the hypothesized descriptions. Items such as “I have a hard time paying attention” and “When my parents ask me to do something, sometimes I forget what they told me” loaded strongly on the BPI- Attention Modulation (BPI-AM) component, whereas items such as “I’m not good at waiting to open gifts” and “I get upset easily” loaded strongly on the BPI-Self Regulation (BPI-SR) component. Considered separately, the BPI-AM and BPI-SR components showed moderate to strong internal consistency, $\alpha = .68$ and $\alpha = .78$, respectively, and component scores across participants were strongly correlated, $r(123) = .46, p < .001$. This suggests that overall composite scale scores yielded relevant information in addition to the separable subscale scores. Replication of these patterns will

be key to establishing the extent to which children's self-reports of these abilities are reliable and tend to meaningfully cluster along the two components discovered here. However, this evidence represents the first encouraging step towards answering the question of whether young children can reliably describe their perceptions of stable skills like cognitive control and its constituent components.

Research Question and Hypothesis 2. The second research question addressed by this study queried whether children's self-reports of cognitive control correspond to parent reports of similar traits and abilities. This question specifically addressed the extent to which children's responses to the BPI-CC scale might be externally valid. I hypothesized that children's scale responses would be correlated with parent reports of children's cognitive control skills. Parent reports are commonly used to establish external convergent validity of child self-report measures. For example, Measelle and colleagues (2005) found that parent reports of personality traits corresponded with children's self-reports of similar traits using the BPI format. Overall, this hypothesis was supported. Global analyses in the multitrait-multimethod correlation matrix suggested that BPI-CC scores were significantly positively correlated with parents' responses to the Parent Form-CC and the previously validated BRIEF measure of children's executive functioning, but were not related to the CBQ composite Effortful Control score. More detailed analyses revealed that children's responses to the BPI – CC scale and subscales were moderately correlated with parents' responses on the Parent Form scale and subscales. Those correlations were strengthened slightly when controlling for age. Among the subscale correlations, the strongest was the age-controlled correlation between parent and child versions of the self-regulation subscale, $r(122) = .30, p = .001$.

The correlation between parent and child responses on the attention modulation subscale was notably weaker $r(122) = .20, p = .027$, but still statistically significant. One plausible interpretation of this pattern of findings is that parents and children were both better able to accurately report on children's self-regulation skills than children's attention modulation skills. However, a range of other possible explanations is available for the findings. For example, parents might have reasonable access to their children's attention modulation skills, but the BPI-AM scale might simply not be adequate at capturing children's own reports of these skills. Internal consistency estimates for this scale were lower than that of the BPI-SR scale ($\alpha = .68$, compared to $\alpha = .78$). This reduced reliability might be reflected in the attenuated correlation for the BPI-AM scale. It also may be the case that children are quite capable of reporting on both their self- and emotion-regulation abilities and their attention modulation skills, but that parents only have adequate ability to report on their children's self-regulation behaviors. Research among clinical samples shows that parents often provide more accurate reports of externalizing behaviors than internalizing behaviors, presumably because externalizing behaviors are more readily visible and notable to parents (e.g., Hinshaw, Han, Erhardt, & Huber, 1992). To the extent that self-regulation abilities mirror externalizing behaviors and attention modulation skills are akin to internalizing behaviors, parents may simply have more access to children's self-regulation abilities and their reports reflect this.

In addition to correspondence with the Parent Form versions of the new scale, children's BPI-CC responses also showed moderate correlations with other previously validated parent reports of cognitive-control related skills. Responses on the full BPI-CC scale and the two subscales were each correlated with the modified BRIEF composite

score, which held even when age and verbal ability were controlled. Although BPI-CC scores were not correlated with the CBQ Effortful Control composite, CBQ subscales for Anger and Frustration and Soothability were both correlated with the BPI-SR subscale, but not with the BPI-AM subscale. The CBQ subscales measuring attentional focus, activity level, impulsivity, perceptual sensitivity, low-intensity pleasure, and inhibitory control were not significantly related to the full scale or either of the subscales. Taken together, these findings further suggest that parents were most able to recognize and report on children's emotion and self-regulation abilities, but had less access to children's attention modulation abilities.

Research Question and Hypothesis 3. Finally, the third research question addressed in this study was: will children's self-reports of cognitive control correspond to performance on behavioral lab tasks that measure components of cognitive control? This research question also addressed the potential external validity of children's responses on the BPI-CC scale. I hypothesized that BPI-CC scale responses would also be correlated with performance on lab tasks capturing executive function and attention regulation skills. As it turned out, correlations between children's BPI-CC scores and the composite EF score were not significant., Detailed analyses also revealed few significant correlations between the lab tasks and children's self-reports, and these relationships were opposite to the predicted direction. BPI-SR scores were negatively correlated with both the working memory task and the HTKS task, suggesting children who reported higher self-regulation skills performed worse on these lab tasks. When age was controlled, these correlations approached zero and fell below significance. The negative raw correlations are likely explained by the opposite age effects for the BPI-SR and the

lab tasks. Overall, children's self-reports on the BPI-SR subscale tended to decrease with age, whereas performance on lab tasks tended to improve with age. When age was controlled, partial correlations between lab tasks and BPI-CC scale and subscale scores each approached zero. These patterns suggest that children's self-reports of cognitive-control skills on the BPI-CC scale were not related to performance on these lab tasks.

Parent responses on the Parent Form-CC scale were significantly positively correlated with the composite EF score, but these were attenuated and fell below significance when age and verbal ability were controlled. Detailed analyses revealed that the Parent Form-CC scale and subscales were also not related to children's lab-task performance, with the exception of significant age-controlled partial correlations between the HTKS task and the Parent Form – CC full scale and the Parent Form – AM subscale, $r(77) = .25, p = .026$; $r(77) = .26, p = .019$, respectively. Significant age controlled correlations of children's lab-task performance with previously validated parent report measures were modest, but few and far between. Scores on the flanker task were modestly negatively correlated with CBQ subscales for activity level, impulsivity, and inhibitory control. HTKS scores were positively correlated with the CBQ subscale for attentional focus and the BRIEF composite score. Dimensional change card sort task scores and working memory scores were not related to the parent report measures.

The lack of correspondence between children's reports of their cognitive control skills and their actual performance on lab tasks might point to a lack of external validity for such self-reports. However, meta-analyses of studies comparing children's performance on lab tasks measuring executive function skills with their parents' reports of such skills have shown that correspondence between these two types of measures

occurs only rarely and with only very modest strength (Toplak, West, & Stanovich, 2013). This pattern of relations among these measurement types underscores the need for a multi-informant multi-method approach to understanding complex developmental constructs in children (Kraemer, Measelle, Ablow, Essex, Boyce, & Kupfer, 2003).

Finally, it might also be true that the lab tasks administered in this study captured variance associated with skills that children are less able to reflect and report on and failed to include tasks that measure skills children can report on. Specifically, the battery of lab tasks lacked any assessment of children's emotional or self-regulation beyond inhibitory control. Considering that children's responses on the BPI-SR scale (which seemed to capture more of these emotion and self-regulation abilities) were more robustly correlated with parent reports of such skills, it might be the case that children's performance on tasks that capture individual differences in emotion- and self-regulation would show stronger correlations with the BPI-SR subscale than the tasks included in this study. Future studies investigating the predictive validity of the child BPI-CC scale might benefit from including tasks that specifically capture self- and emotion-regulation skills. These might include measures of delay of gratification such as the gift delay task (Kochanska, Murray, Jacques, Koenig, & Vendegeest, 1996) or frustration tolerance such as the transparent box task in the LabTab battery of tasks (Goldsmith, Reilly, Lemery, Longley, & Prescott, 1993). Additionally, measures of children's self-regulation in a variety of contexts, such as teacher reports of classroom behaviors, might also provide more nuanced measures of the skills the BPI-SR subscale is capturing.

Relationships With Other Self-Reports. The BPI-CC scale and subscales were strongly correlated with each of the other self-reports gathered from children that were

included in this analysis – Conscientiousness, Neuroticism, and Extraversion – even when age was controlled. It is likely that a substantial portion of the variance shared across these measures can be attributed to the method of administration. Not only were each of these subscales measured via self-report, they were measured using the same puppet interview format in the same interview session. However, as predicted, correlations between the BPI-CC scale and subscales were stronger among Conscientiousness and Neuroticism (age-controlled r s ranged from .45 - .53, all p s < .001) – two personality traits hypothesized to be most closely aligned with cognitive control and emotion- and self-regulation – than with Extraversion (age controlled r s between .27 and .33, all p s < .05). This attenuated correlation with Extraversion in comparison to the relationships with BPI-CC and its subscales might indicate that relations between Conscientiousness, Extraversion, and BPI-CC represent a combination of shared method variance as well as shared construct variance.

Age Effects. Comparisons across age groups yielded an interesting pattern such that, with age, children tended to report significantly reduced self-regulation functioning based on their self-reports on the BPI-SR subscale. Although mean self-reported self-regulation scores decreased monotonically with age, the oldest children, 7-year-olds, still reported fairly high self-regulation skills with a mean score of 4.17 – above the midpoint of the scale. This overall pattern of overly positive self-reports among younger children is of course reflected widely in the cognitive developmental literature (e.g., Schneider et al., 2000; Shin, Bjorklund, & Beck, 2007). However, this age-related pattern was either not present for other measures of children’s cognitive control (as in children’s self-reports of

Attention Modulation and parent reports) or it was reversed (as in children's self-reported Conscientiousness and lab tasks measuring executive functioning).

The contrasting age-related pattern across BPI-SR reports and Conscientiousness reports might be explained by relationships with overall verbal ability. The raw correlation between these two scales was fairly strong and positive, $r(70) = .33, p = .005$, but, nevertheless, showed an opposite pattern with respect to age (which, of course, was very strongly, positively correlated with verbal ability $r(80) = .70, p < .001$). While Conscientiousness scores were not significantly correlated with verbal ability scores, $r(70) = .19, p = .117$, responses to the BPI-SR subscale were strongly negatively related to verbal scores, $r(80) = -.40, p < .001$, suggesting children with stronger verbal skills tended to report lower self-regulation skills. Indeed, when verbal ability was controlled, Conscientiousness and BPI-SR partial correlations with age both approached zero and fell below significance, $r(69) = .16, p = .179$, and $r(79) = -.10, p = .354$, respectively, but the correlation between the two scales was strengthened, $r(69) = .44, p < .001$. Scores on the BPI-AM subscale showed no such raw correlation with age, $r(123) = -.06, p = .528$, and only a marginal relationship with verbal ability, $r(80) = -.19, p = .086$.

Verbal ability might influence scores on these two scales differently due to the differential linguistic demands each set of items placed on these young participants. The eight items on the Conscientiousness subscale had an average 8.38 words per item, with a maximum of 10, whereas the seven items on the BPI-SR subscale averaged 11.14 words, with three of the items comprising 13 words or more and a maximum of 16 words. It may be that the simpler linguistic structure of the Conscientiousness scale yielded more valid responses, as children could adequately comprehend, process, and answer the items. The

additional verbosity and linguistic complexity of the BPI-SR items might have resulted in younger participants yielding to an affirmation-bias in which young children are more likely to answer in the affirmative (e.g., Okanda & Itakura, 2010). Fritzley and Lee (2003) demonstrated that verbal ability might, in fact, explain when children tend to show such a bias. In their work, preschool-aged children were more likely to exhibit a yes-bias when questions were focused on objects they were unfamiliar with. A key difference is that these studies focused specifically on yes-no questions, which is not the format of the items administered here. However, a similar bias might be present when children are given two responses from which to choose. Future scale refinement efforts will target reduction of linguistic demands on children to mitigate this potential effect.

Differences in verbal ability might also lead to different patterns of responding to these two scales because language skills may play a deeper role in the development of cognitive control skills, the awareness of such skills, or both. Language skills in early childhood have been shown to uniquely predict developmental trajectories of children's self-regulation skills (Vallotton & Ayoub, 2011). Similarly, language skills have long been hypothesized to meaningfully facilitate the development of autobiographical memory by providing a rationale for how and why things happen to oneself (e.g., Fivush, 2011). It may be the case that as language skills mature in early childhood, children's underlying cognitive control skills are undergoing differential developmental patterns. Simultaneously, children's understanding of their cognitive control skills may also begin to crystalize as a function of their language development. Scale refinement and validation projects should consider the role of language skills in the development of trait cognitive control skills and the facilitation of children's awareness of these skills.

Limitations

This study represents the first step towards building a tool enabling researchers to capture what young children understand about their own cognitive control abilities. In this modest initial development and validation effort, a small set of behavioral tasks and parent reports was employed to capture external construct validity across a relatively wide developmental age range. Some of the lab tasks assessing executive functioning abilities may not have been developmentally appropriate for the broad range of ages represented in this study. In particular, scores on the NIH Toolbox list-sorting task capturing working memory capacity were badly skewed reflecting a substantial floor effect. Additionally, the behavioral tasks used in the study seem designed to capture skills more associated with attention modulation and memory (the self-report subscale that was less robustly correlated with external validation measures), than skills associated with the subscale that showed stronger correlations with parent reports: self- and emotional-control. Future studies aimed at validation of the scale will include tasks that capture a more thorough snapshot of all aspects of cognitive control. Finally, it should be noted that these lab tasks designed to capture various aspects of cognitive control, which require substantial regulatory functioning simply to complete, were administered at the end of a fairly taxing 20-30 minute interview requiring consistent self-reflection and engagement with the experimenter via the puppet interviewers. Overall participant fatigue during these tasks might have contributed to the lack of correspondence among measures. Future studies should be designed to reduce demands and keep potential fatigue to a minimum to mitigate this possible confound.

In addition to including more appropriate lab tasks, more sources of external validation should be employed overall. On one hand, the present package of findings provides initial validation of the BPI-CC scale, as parent's perceptions of their children's cognitive control skills seem to overlap reasonably well with children's perceptions of themselves with respect to these skills. On the other hand, clearly there is a need for additional forms of validation to be employed. As Measelle and colleagues (2005) point out, the practice of using parent or teacher reports to establish external validity of child self-reports is not without flaws. Namely, parent reports and child self-reports tend to be only modestly correlated at best (Kraemer et al., 2003) and are considered to be biased by some (e.g., Fantuzzo et al., 1996). Indeed, some researchers in the self-concept field go so far as to consider parent and teacher reports of such characteristics to be a wholly distinct construct from one's own self-reported self-concept (Marsh et al., 2002, Shavelson et al., 1976). A multi-informant approach to understanding behavior, skills, and traits is the best approximation of a "gold standard" measurement of a construct, (e.g., Merrel, 1999; Kraemer et al., 2003), and a similar approach should be employed in validation efforts. Future attempts at validation of the new scale should include reports from parents, teachers, and an exhaustive battery of behavioral tasks that capture variance in relevant skills.

Additionally, as in many developmental studies, a larger sample size will allow for more in-depth investigations of age differences. This study yielded some interesting patterns with respect to age effects that warrant further investigation. However, the current study lacks statistical power for many of the questions that arose as a result of these patterns.

Finally, the scope of this first round of scale development and validation precluded the collection of a second sample of interviews following the initial scale analysis. Results of the validation analyses presented here are based on children's responses to the 17 most relevant items extracted from interviews in which the children answered all 26 items. Thus, analysis does not allow for conclusions to be drawn regarding how children might respond to only those 17 items. Future scale refinement efforts will allow for more thorough investigations into this.

Implications for Developmental Understanding.

Will we discover that the ability to reflect and report on one's cognitive control skills is an individual difference that is meaningfully predictive of outcomes? If so, what might it mean for a child to lack veridical understanding of his or her cognitive control skills? One possibility is that a lack of understanding or access to cognitive control abilities might lead children to select inappropriate or ineffective strategies for regulating cognition and behavior. In the metacognition literature, children's overconfidence in their cognitive abilities has been shown to lead to poor self-regulation and underperformance (e.g., Thiede, 2003). A similar pattern may emerge with respect to cognitive control skills, such that children who are inaccurate tend to either choose regulatory strategies that are ineffective for the situation, or fail to activate effective strategies. Another cue from the metacognition literature, in which young children are able to monitor learning, but are unable to execute control behaviors to update learning strategies, suggests that children may, in fact, be able to report on their cognitive control abilities (Roebbers et al., 2014), but that this knowledge fails to impinge on regulatory functioning. Uncovering

such relationships between self-knowledge and behavior requires establishing effective methods for capturing reliable measures of children's self-perceptions. This dissertation provides the first step in this important direction.

Future Directions

Additional iterations of scale development and validation are certainly in order for the BPI-CC scale and will include refinements to individual items, replication of the scale structure, and targeted, larger-scale validation efforts.

Scale Refinement. A primary goal of future research endeavors will be to refine the specific items that comprise the children's interview scale itself. Patterns across the wide age-range included in the present research suggest that the length and linguistic structure of individual items may play a role in the validity of responses they yield. Particular attention should be paid to reducing such linguistic demands. However, in so doing, the internal structure of the scale might change. Scale analysis in the current study suggested the presence of two separable, but correlated, components that capture self- and emotion-regulation skills and attention modulation, respectively. Given the differential age- and verbal ability- effects found for these two components, it may be the case that refining the individual items to account for verbal skill might shift the internal structure of scale responses. Thus, replication of the scale structure found here will also be important to demonstrate going forward. Future investigations into the Parent Form version of the scale should also include alternative ways of analyzing its internal component structure. Specifically, future efforts should focus on patterns of parent responses to items that are most relevant according to children's responses to

corresponding interview items. This approach will allow for more direct comparison across the parent and child versions of the scale.

External Validation Via Appropriate Behavioral Tasks. Finding and employing behavioral lab tasks that capture the precise skills and abilities that the BPI-CC asks children about will be most important. The lack of correspondence between children's self-reports on this scale and the lab tasks used in this study might be a reflection of the mismatch between the skills addressed in the scale and the skills used to execute the tasks. More appropriate tasks that capture a broader range of cognitive control abilities, including self- and emotion-regulation skills, will help to establish and clarify the validity of the scale. It may be the case that lab-based tasks do not adequately capture the skills that the BPI-CC scale asks children to report on. Instead, more distal measures such as teacher reports of classroom behavior patterns and academic outcomes including school readiness might yield a more holistic picture of a child's cognitive control abilities.

Understanding Developmental Effects. The results of this study revealed some interesting differences in children's responses across age. However, this study lacks the statistical power to undertake any substantial investigations into these age effects. A number of hypotheses were put forth to account for these patterns and future research should address these. One possible method for exploring age patterns in the future might be to compare responses from children who have experienced some structured school or preschool setting with those children who have not yet begun school or preschool. This transition to school reflects important changes in children's social environments and introduces new expectations from the adults around them. These new sources of social feedback may play important roles in shaping how children think about their skills.

Future research into the developmental patterns in children's responses to scale items should investigate such possible effects in addition to other age related influences.

“Value-Added” Predictive Validity. Ideally, this new self-report tool will ultimately be able to provide unique insights into children's development, understanding, and abilities in addition to already validated parent-reports, teacher-reports, and behavioral assessments. Understanding what children know about themselves might help shed light on their internal cognitive processes. The first step in addressing whether children's self-reports of their own abilities are useful in this way is to establish whether they can even provide such reports reliably. The results of this study offer evidence that children can, in fact, report reliably and coherently about their own cognitive control skills. The next step, to be addressed in future projects, will be to establish whether these reports predict unique variance in children's behavioral or academic outcomes, developmental change over time, and/or success with intervention efforts.

Conclusion

There is reason for optimism that the BPI-CC scale will be useful as a tool for helping researchers, teachers, and clinicians understand not only what children think about themselves, but also how those perceptions shape children's learning and behavior. Self-perceptions of cognition and abilities have been shown to play key roles in influencing learning behaviors (Bong & Skaalvik, 2013; Dweck & Leggett, 1988; Caprara, Vecchione, Alessandri, Gerbino, & Barbaranelli, 2011; Marsh & Martin, 2011). A well-validated measure of children's perceptions of their own cognitive control will

play an important role in furthering this understanding and uncovering new ways to understand how children learn.

Refinement of new psychometric tools is a lengthy, iterative process. This is the first of many steps towards establishing a method of tapping into what children know about their cognitive control and gaining a better understanding of what that knowledge means for children and their developmental functioning. The present findings strongly suggest that children are able to provide coherent, reliable, consistent reports of their cognitive control skills; additionally, these reports correspond systematically with their parents' assessment of children's cognitive control skills. This promising new self-report tool needs more development and refinement, but holds potential to play a key role in uncovering ways in which children's self-perceptions inform how they behave.

APPENDIX A

FULL LIST OF INITIAL 26 BPI-COGNITIVE CONTROL SCALE ITEMS

1. I don't get upset when I'm told that it's time for bed.
I get upset when I'm told that it's time for bed.
2. I like to work on solving hard puzzles.
I don't like to work on solving hard puzzles.
3. I always take my time when I'm choosing what to do next.
I never take my time when I'm choosing what to do next.
4. I get upset easily.
I don't get upset easily.
5. When I'm working on something, I don't get distracted by things around me.
When I'm working on something, I get distracted by things around me.
6. I'm good at figuring out games with lots of steps.
I'm not good at figuring out games with lots of steps.
7. When I get really angry with someone, I don't hit them.
When I get really angry with someone, sometimes I'll hit them.
8. I have a hard time sitting still when I'm about to do something really fun.
I don't have a hard time sitting still when I'm about to do something really fun.
9. I run inside a lot.
I don't run inside a lot.
10. It's hard for me to calm down after a really exciting activity.
It's not hard for me to calm down after a really exciting activity.
11. I think carefully about how someone will feel before I say something to them.
I don't think carefully about how someone will feel before I say something to them.
12. I'm not good at waiting for fun stuff.
I'm good at waiting for fun stuff.
13. When I start to play a game or puzzle, I usually don't finish them.
When I start to play a game or puzzle, I finish them.
14. When I'm building something, I like to work on it for a long time.
When I'm building something, I don't like to work on it for a long time.

15. When a grown-up gives me instructions, it's hard for me to remember all of them at once.
When a grown-up gives me instructions, it's not hard for me to remember all of them at once.
16. I'm not good at focusing on my work when other kids are being noisy or bad.
I'm good at focusing on my work when other kids are being noisy or bad.
17. I think hard about what I'm going to say before I say it.
I don't think hard about what I'm going to say before I say it.
18. I usually forget things.
I don't forget things.
19. When I'm playing and my parents tell me it's time to stop, I get mad.
When I'm playing and my parents tell me it's time to stop, I don't get mad.
20. When I have a goal, I'm not good at thinking about all the things I need to do to make it happen.
When I have a goal, I'm good at thinking about all the things I need to do to make it happen.
21. When I'm telling a story, sometimes I forget what I'm saying.
When I'm telling a story, I don't forget what I'm saying.
22. I usually have a hard time sitting still.
I don't have a hard time sitting still.
23. I have a hard time paying attention.
I don't have a hard time paying attention.
24. When my parents ask me to do something, sometimes I forget what they told me.
When my parents ask me to do something, I don't forget what they told me.
25. I'm not good at waiting to open gifts.
I'm good at waiting to open gifts
26. When it's time to stop playing and do something else, I have a hard time.
When it's time to stop playing and do something else, I don't have a hard time.

APPENDIX B

LIST OF 7 BPI-SELF REGULATION SUBSCALE ITEMS

1. I get upset easily.
I don't get upset easily.
2. When I'm working on something, I don't get distracted by things around me.
When I'm working on something, I get distracted by things around me.
3. When I get really angry with someone, I don't hit them.
When I get really angry with someone, sometimes I'll hit them.
4. I have a hard time sitting still when I'm about to do something really fun.
I don't have a hard time sitting still when I'm about to do something really fun.
5. I'm not good at waiting for fun stuff.
I'm good at waiting for fun stuff.
6. When I'm playing and my parents tell me it's time to stop, I get mad.
When I'm playing and my parents tell me it's time to stop, I don't get mad.
7. I'm not good at waiting to open gifts.
I'm good at waiting to open gifts

APPENDIX C

LIST OF 10 BPI-ATTENTION MODULATION SUBSCALE ITEMS

1. It's hard for me to calm down after a really exciting activity.
It's not hard for me to calm down after a really exciting activity.
2. When a grown-up gives me instructions, it's hard for me to remember all of them at once.
When a grown-up gives me instructions, it's not hard for me to remember all of them at once.
3. I'm not good at focusing on my work when other kids are being noisy or bad.
I'm good at focusing on my work when other kids are being noisy or bad.
4. I usually forget things.
I don't forget things.
5. When I have a goal, I'm not good at thinking about all the things I need to do to make it happen.
When I have a goal, I'm good at thinking about all the things I need to do to make it happen.
6. When I'm telling a story, sometimes I forget what I'm saying.
When I'm telling a story, I don't forget what I'm saying.
7. I usually have a hard time sitting still.
I don't have a hard time sitting still.
8. I have a hard time paying attention.
I don't have a hard time paying attention.
9. When my parents ask me to do something, sometimes I forget what they told me.
When my parents ask me to do something, I don't forget what they told me.
10. When it's time to stop playing and do something else, I have a hard time.
When it's time to stop playing and do something else, I don't have a hard time.

APPENDIX D

FULL LIST OF 26 PARENT FORM-COGNITIVE CONTROL SCALE ITEMS

Please read each pair of statements below and CIRCLE the number that corresponds with your opinion of your child's overall behaviors and tendencies. Lower numbers indicate that your child is more like the statement on the left. Higher numbers indicate that your child is more like the statement on the right.

My child....

1	...gets upset when s/he is told that it's time for bed.	1	2	3	4	5	6	7	...doesn't get upset when s/he is told that it's time for bed.
2	...doesn't like to work on solving hard puzzles.	1	2	3	4	5	6	7	...likes to work on solving hard puzzles.
3	...never takes his/her time when choosing what to do next.	1	2	3	4	5	6	7	...always takes his/her time when choosing what to do next.
4	...gets upset easily	1	2	3	4	5	6	7	...doesn't get upset easily.
5	...gets distracted by things around him/her when working on something.	1	2	3	4	5	6	7	...doesn't get distracted by things around him/her when working on something.
6	...is not good at figuring out games with lots of steps.	1	2	3	4	5	6	7	...is good at figuring out games with lots of steps.
7	...sometimes hits people when angry with them.	1	2	3	4	5	6	7	...doesn't hit people when angry with them.
8	...has a hard time sitting still when s/he is about to do something really fun.	1	2	3	4	5	6	7	...doesn't have a hard time sitting still when s/he is about to do something really fun.
9	...runs inside a lot.	1	2	3	4	5	6	7	...doesn't run inside a lot.
10	...has a hard time calming down after a really exciting activity.	1	2	3	4	5	6	7	...doesn't have a hard time calming down after a really exciting activity.
11	...doesn't think carefully about how someone will feel before saying something to them.	1	2	3	4	5	6	7	...thinks carefully about how someone will feel before saying something to them.
12	...is not good at waiting for fun stuff.	1	2	3	4	5	6	7	...is good at waiting for fun stuff.

13	...usually doesn't finish games or puzzles s/he starts to play.	1	2	3	4	5	6	7	...finishes games or puzzles s/he starts to play.
14	...doesn't like to work on building things for a long time.	1	2	3	4	5	6	7	...likes to work on building things for a long time.
15	...,when given instructions by a grown-up, has a hard time remembering all of them at once.	1	2	3	4	5	6	7	...,when given instructions by a grown-up, doesn't have a hard time remembering all of them at once.
16	...is not good at focusing on his/her work when other kids are being noisy or bad.	1	2	3	4	5	6	7	...is good at focusing on his/her work when other kids are being noisy or bad.
17	...doesn't think hard about what s/he is going to say before saying it.	1	2	3	4	5	6	7	...thinks hard about what s/he is going to say before saying it.
18	...usually forgets things.	1	2	3	4	5	6	7	...doesn't forget things.
19	...gets mad when told it's time to stop playing.	1	2	3	4	5	6	7	...doesn't get mad when told it's time to stop playing.
20	...is not good at thinking about all the things s/he needs to do to accomplish a goal.	1	2	3	4	5	6	7	...is good at thinking about all the things s/he needs to do to accomplish a goal.
21	...sometimes forgets what s/he is saying when telling a story.	1	2	3	4	5	6	7	...doesn't forget what s/he is saying when telling a story.
22	...usually has a hard time sitting still.	1	2	3	4	5	6	7	...doesn't have a hard time sitting still.
23	...has a hard time paying attention	1	2	3	4	5	6	7	...doesn't have a hard time paying attention.
24	...,when asked to do something, sometimes forgets what s/he has been told.	1	2	3	4	5	6	7	...,when asked to do something, doesn't forget what s/he has been told.
25	...is not good at waiting to open gifts.	1	2	3	4	5	6	7	...is good at waiting to open gifts.
26	...has a hard time when it's time to stop playing and do something else.	1	2	3	4	5	6	7	...doesn't have a hard time when it's time to stop playing and do something else.

APPENDIX E

LIST OF 10 PARENT FORM-SELF REGULATION SUBSCALE ITEMS

1	...gets upset when s/he is told that it's time for bed.	1	2	3	4	5	6	7	...doesn't get upset when s/he is told that it's time for bed.
2	...sometimes hits people when angry with them.	1	2	3	4	5	6	7	...doesn't hit people when angry with them.
3	...has a hard time sitting still when s/he is about to do something really fun.	1	2	3	4	5	6	7	...doesn't have a hard time sitting still when s/he is about to do something really fun.
4	...runs inside a lot.	1	2	3	4	5	6	7	...doesn't run inside a lot.
5	...has a hard time calming down after a really exciting activity.	1	2	3	4	5	6	7	...doesn't have a hard time calming down after a really exciting activity.
6	...is not good at waiting for fun stuff.	1	2	3	4	5	6	7	...is good at waiting for fun stuff.
7	...gets mad when told it's time to stop playing.	1	2	3	4	5	6	7	...doesn't get mad when told it's time to stop playing.
8	...usually has a hard time sitting still.	1	2	3	4	5	6	7	...doesn't have a hard time sitting still.
9	...is not good at waiting to open gifts.	1	2	3	4	5	6	7	...is good at waiting to open gifts.
10	...has a hard time when it's time to stop playing and do something else.	1	2	3	4	5	6	7	...doesn't have a hard time when it's time to stop playing and do something else.

APPENDIX F

LIST OF 13 PARENT FORM-ATTENTION MODULATION SUBSCALE ITEMS

1	...doesn't like to work on solving hard puzzles.	1	2	3	4	5	6	7	...likes to work on solving hard puzzles.
2	...never takes his/her time when choosing what to do next.	1	2	3	4	5	6	7	...always takes his/her time when choosing what to do next.
3	...gets upset easily	1	2	3	4	5	6	7	...doesn't get upset easily.
4	...gets distracted by things around him/her when working on something.	1	2	3	4	5	6	7	...doesn't get distracted by things around him/her when working on something.
5	...is not good at figuring out games with lots of steps.	1	2	3	4	5	6	7	...is good at figuring out games with lots of steps.
6	...doesn't think carefully about how someone will feel before saying something to them.	1	2	3	4	5	6	7	...thinks carefully about how someone will feel before saying something to them.
7	...usually doesn't finish games or puzzles s/he starts to play.	1	2	3	4	5	6	7	...finishes games or puzzles s/he starts to play.
8	...doesn't like to work on building things for a long time.	1	2	3	4	5	6	7	...likes to work on building things for a long time.
9	...,when given instructions by a grown-up, has a hard time remembering all of them at once.	1	2	3	4	5	6	7	...,when given instructions by a grown-up, doesn't have a hard time remembering all of them at once.
10	...doesn't think hard about what s/he is going to say before saying it.	1	2	3	4	5	6	7	...thinks hard about what s/he is going to say before saying it.
11	...usually forgets things.	1	2	3	4	5	6	7	...doesn't forget things.
12	...is not good at thinking about all the things s/he needs to do to accomplish a goal.	1	2	3	4	5	6	7	...is good at thinking about all the things s/he needs to do to accomplish a goal.
13	...,when asked to do something, sometimes forgets what s/he has been told.	1	2	3	4	5	6	7	...,when asked to do something, doesn't forget what s/he has been told.

APPENDIX G

LIST OF 41 BPI BIG-5 PERSONALITY TRAIT ITEMS BY SUBSCALE

Conscientiousness

1. I like schoolwork that's hard.
I don't like schoolwork that's hard.
2. I'm not doing a good job in school
I'm doing a good job in school
3. When I can't figure something out, I give up.
When I can't figure something out, I don't give up.
4. I don't make mistakes a lot.
I make mistakes a lot.
5. I think it isn't important to do well in school.
I think it is important to do well in school.
6. When I work alone, I do a good job.
When I work alone, I don't do a good job.
7. When my schoolwork is hard, I don't try my best.
When my schoolwork is hard, I try my best.
8. I don't try my best in school.
I try my best in school.

Neuroticism

1. I am a dumb kid.
I am not a dumb kid.
2. I don't like myself.
I like myself.
3. I don't hate myself.
I hate myself.
4. I worry a lot.
I don't worry a lot.
5. I don't cry a lot.
I cry a lot.

6. I get nervous if a teacher calls on me.
I don't get nervous if a teacher calls on me.
7. Bad things don't happen to me
Bad things happen to me
8. I am sad a lot.
I'm not sad a lot.

Extraversion

1. I'm not shy when I meet new people.
I'm shy when I meet new people.
2. I don't have friends at school.
I have friends at school.
3. It's not hard for me to make new friends.
It's hard for me to make new friends.
4. Other kids ask me to do things with them.
Other kids don't ask me to do things with them.
5. I don't ask other kids to play.
I ask other kids to play.
6. It's easy for me to make new friends.
It's not easy for me to make new friends.
7. I won't make new friends next year.
I will make new friends next year.
8. If kids are playing, I ask if I can play too.
If kids are playing, I don't ask if I can play too.
9. When I wake up on school days, I feel happy.
When I wake up on school days, I don't feel happy.

Other Items Not Included in the Present Analyses

1. I'm not a smart kid.
I'm a smart kid.
2. If someone is mean to me, I don't hit them.
If someone is mean to me, I hit them.

3. When a friend is upset, I get sad.
When a friend is upset, I don't get sad.
4. I do not get mad at kids at school.
I get mad at kids at school.
5. I get mad when someone does better than me.
I don't get mad when someone does better than me.
6. I like school
I don't like school
7. Other kids like me.
Other kids don't like me.
8. I don't feel bad after I have an argument with another kid.
I feel bad after I have an argument with another kid.
9. I learn things well.
I don't learn things well.
10. Other kids think I am mean.
Other kids don't think I am mean.
11. I'll be smart next year.
I won't be smart next year.
12. My friends are nice to me.
My friends are not nice to me.
13. I don't pick on other kids.
I pick on other kids.
14. I'm a good friend to have.
I'm not a good friend to have.
15. I have arguments with friends.
I don't have arguments with friends.
16. I have good ideas.
I don't have good ideas.

APPENDIX H

HEAD-TOES-KNEES-SHOULDERS TASK PROCEDURE

Child ID: _____

HEAD-TOES-KNEES-SHOULDERS (HTKS)

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Parts I, II, and III
FORM A – Extended

REFERENCES:

- McClelland, M. M., Cameron, C. E., Connor, C. M., Farris, C. L., Jewkes, A. M., & Morrison, F. J. (2007). Links between behavioral regulation and preschoolers' literacy, vocabulary, and math skills. *Developmental Psychology, 43*, 947-959.
- Cameron Ponitz, C. E., McClelland, M. M., Matthews, J. S., & Morrison, F. J. (2009). A structured observation of behavioral self-regulation and its contribution to kindergarten outcomes. *Developmental Psychology, 45*, 605-619.
- Cameron Ponitz, C. E., McClelland, M. M., Jewkes, A. M., Connor, C. M., Farris, C. L., & Morrison, F. J. (2008). Touch your toes! Developing a direct measure of behavioral regulation in early childhood. *Early Childhood Research Quarterly, 23*

Directions: After establishing positive rapport with the child, say or read the directions in **bold type** aloud. Words in CAPITAL LETTERS should be emphasized. Administer the task seated or standing; the child should stand, about 3 feet from you, during the task. Administer Part II if the number of points in the testing section totals to 4 or more. Administer Part III if the number of points in the testing section totals to 4 or more.

The person symbol indicates that you should perform the motion to demonstrate the correct movement to the child. If the child produces the correct (opposite) response immediately, score the item "2". If they self-correct to the correct response, score the item "1". If they do not touch the correct part of their body at all or touch the named part, score the item "0".



A self-correct occurs if the child makes any discernible motion toward an incorrect response, but then changes his/her mind and makes the correct response. Pausing to think, not moving, and then responding correctly does not count as a self-correction – it would be scored as correct.

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PART I: INTRODUCTION

Now we're going to play a game. The game has two parts. First, copy what I do. Touch your head.



Touch your head; wait for the child to touch his/her head.

Good! Now touch your toes.



Touch your toes; wait for the child to touch his/her toes.

Repeat the two commands with motions again, or until the child imitates you correctly.

PART I: PRACTICE

Now we're going to be a little silly and do the **OPPOSITE** of what I say. When I say touch your **HEAD**, **INSTEAD** of touching your head, you touch your **TOES**. When I say touch your **TOES**, you touch your **HEAD**. So you're doing something **DIFFERENT** from what I say.



If the child responds correctly: Provide positive feedback on each practice item where the child responds correctly.

***If the child responds incorrectly* at any point during the practice portion, provide additional explanations up to 3 times before beginning the test portion:

Remember, when I say to touch your ____, you touch your ____, so you are doing something **DIFFERENT** from what I say. Let's try another one.



→ Number of additional explanations given: 0 1 2 3

	incorrect	self-correct	correct
A1. What do you do if I say "touch your head"?	0 (other than toes)	1	2 (toes)
A2. What do you do if I say "touch your toes"?	0 (other than head)	1	2 (head)

If the child responds verbally: "can you show me?"

Ok, let's practice a few more.

	incorrect	self-correct	correct
B1. Touch your head	0 (other than toes)	1	2 (toes)
B2. Touch your toes	0 (other than head)	1	2 (head)
B3. Touch your head	0 (other than toes)	1	2 (toes)
B4. Touch your toes	0 (other than head)	1	2 (head)

Proceed to Part I test section. Do not explain any parts of the task again. Do not provide feedback during the test portion.

Child ID: _____

PART I: TESTING

We will keep playing this game, and you keep doing the **OPPOSITE** of what I say.

	<u>Incorrect</u>	<u>Self-Correct</u>	<u>Correct</u>
1. Touch your head	0 (other than toes)	1	2 (toes)
2. Touch your toes	0 (other than head)	1	2 (head)
3. Touch your toes	0 (other than head)	1	2 (head)
4. Touch your head	0 (other than toes)	1	2 (toes)
5. Touch your toes	0 (other than head)	1	2 (head)
6. Touch your head	0 (other than toes)	1	2 (toes)
7. Touch your head	0 (other than toes)	1	2 (toes)
8. Touch your toes	0 (other than head)	1	2 (head)
9. Touch your head	0 (other than toes)	1	2 (toes)
10. Touch your toes	0 (other than head)	1	2 (head)

TOTAL POINTS → IF THE CHILD SCORED **4 OR MORE POINTS**, CONTINUE TO PART II

IF THE CHILD SCORED **LESS THAN 4** POINTS: Thank you for playing this game with me today!

PART II: INTRODUCTION

Ok, now that you've got that part, we're going to add a part. Now, you're going to touch your shoulders and your knees. First, touch your shoulders.



Touch your shoulders; wait for the child to touch his/her shoulders.

Now, touch your knees.



Touch your knees; wait for the child to touch his/her knees.

Repeat the two commands with motions again, or until the child imitates you correctly.

PART II PRACTICE:

Ok, now we're going to be silly again. You keep doing the opposite of what I say like before. But this time, touch your knees and shoulders. When I say to touch your KNEES, you touch your SHOULDERS, and when I say to touch your SHOULDERS, you touch your KNEES.



If the child responds correctly: Provide positive feedback on each practice item where the child responds correctly.

***If the child responds incorrectly* at any point during the practice portion, provide additional explanations up to 2 times before beginning the test portion:

Remember, when I say to touch your ____, instead of touching your ____, you touch your ____. Do the OPPOSITE of what I say.



Number of additional explanations given: 0 1 2

	incorrect	self-correct	correct
C1. What do you do if I say "touch your knees"?	0 (other than shoulders)	1	2 (shoulders)

If the child responds verbally: "can you show me?"

	incorrect	self-correct	correct
D1. Touch your knees	0 (other than shoulders)	1	2 (shoulders)
D2. Touch your shoulders	0 (other than knees)	1	2 (knees)
D3. Touch your knees	0 (other than shoulders)	1	2 (shoulders)
D4. Touch your shoulders	0 (other than knees)	1	2 (knees)

Proceed to Part II test section. Do not explain any parts of the task again. Do not provide feedback during the test portion.

Now that you know all the parts, we're going to put them together. You're going to keep doing the opposite of what I say to do, but you won't know what I'm going to say.

There are four things I could say:

- If I say touch your HEAD, you touch your TOES.
- If I say touch your TOES, you touch your HEAD.
- If I say touch your KNEES, you touch your SHOULDERS.
- If I say touch your SHOULDERS, you touch your KNEES.



Are you ready? Let's try it.

PART II TESTING:

	<i>Incorrect</i>	<i>Self-Correct</i>	<i>Correct</i>
11. Touch your head	0 (other than toes)	1	2 (toes)
12. Touch your toes	0 (other than head)	1	2 (head)
13. Touch your knees	0 (other than shoulders)	1	2 (shoulders)
14. Touch your toes	0 (other than head)	1	2 (head)
15. Touch your shoulders	0 (other than knees)	1	2 (knees)
16. Touch your head	0 (other than toes)	1	2 (toes)
17. Touch your knees	0 (other than shoulders)	1	2 (shoulders)
18. Touch your knees	0 (other than shoulders)	1	2 (shoulders)
19. Touch your shoulders	0 (other than knees)	1	2 (knees)
20. Touch your toes	0 (other than head)	1	2 (head)

TOTAL POINTS → IF THE CHILD SCORED **4 OR MORE POINTS**, CONTINUE TO PART III

IF THE CHILD SCORED **LESS THAN 4 POINTS**: Thank you for playing this game with me today!

PART III INTRODUCTION

You are doing so well we just have one more part! Now we are going to change the rules of the game.

When I say to touch your HEAD, you touch your KNEES.
 When I say touch your KNEES, you touch your HEAD.
 When I say touch your SHOULDERS, you touch your TOES.
 And when I say touch your TOES, you touch your SHOULDERS.



Ok? Let's practice!

If the child responds correctly: Provide positive feedback on each practice item where the child responds correctly.

***If the child responds incorrectly* at any point during the practice portion, provide additional explanations up to 2 times before beginning the test portion:

Remember, we changed the rules. "Touch your head" means touch your KNEES – head goes with knees now. "Touch your shoulders" means touch your TOES – shoulders goes with toes.



Number of additional explanations given: 0 1 2

PART III PRACTICE:

	Incorrect	self-correct	correct
E1. What do you do if I say "touch your head"?	0 (other than knees)	1	2 (knees)
E2. What do you do if I say "touch your shoulders"?	0 (other than toes)	1	2 (toes)

If the child responds verbally: "can you show me?"

	Incorrect	self-correct	correct
F1. Touch your head	0 (other than knees)	1	2 (knees)
F2. Touch your shoulders	0 (other than toes)	1	2 (toes)
F3. Touch your toes	0 (other than shoulders)	1	2 (shoulders)
F4. Touch your knees	0 (other than head)	1	2 (head)

You're doing great! Let's do a few more.

Proceed to Part III test section. Do not explain any parts of the task again. Do not provide feedback during the test portion.

PART III TESTING:

	Incorrect	Self-Correct	Correct
21. Touch your shoulders	0 (other than toes)	1	2 (toes)
22. Touch your head	0 (other than knees)	1	2 (knees)
23. Touch your knees	0 (other than head)	1	2 (head)
24. Touch your toes	0 (other than shoulders)	1	2 (shoulders)
25. Touch your toes	0 (other than shoulders)	1	2 (shoulders)
26. Touch your knees	0 (other than head)	1	2 (head)
27. Touch your shoulders	0 (other than toes)	1	2 (toes)
28. Touch your head	0 (other than knees)	1	2 (knees)
29. Touch your head	0 (other than knees)	1	2 (knees)
30. Touch your shoulders	0 (other than toes)	1	2 (toes)

TOTAL POINTS →

Thank you for playing this game with me today!

To calculate Total Score: Sum "TOTAL POINTS" from each testing section. Score is out of 60.

TOTAL SCORE: _____



APPENDIX I

CHILDREN'S BEHAVIOR QUESTIONNAIRE – SHORT FORM

Instructions: Please read carefully before starting:

On the next pages you will see a set of statements that describe children's reactions to a number of situations. We would like you to tell us what your child's reaction is likely to be in those situations. There are of course no "correct" ways of reacting; children differ widely in their reactions, and it is these differences we are trying to learn about. Please read each statement and decide whether it is a "true" or "untrue" description of your child's reaction within the past six months. Use the following scale to indicate how well a statement describes your child:

- | Circle # | If the statement is: |
|----------|--------------------------------------|
| 1 | extremely untrue of your child |
| 2 | quite untrue of your child |
| 3 | slightly untrue of your child |
| 4 | neither true nor false of your child |
| 5 | slightly true of your child |
| 6 | quite true of your child |
| 7 | extremely true of your child |

If you cannot answer one of the items because you have never seen the child in that situation, for example, if the statement is about the child's reaction to your singing and you have never sung to your child, then circle NA (not applicable).

Please be sure to circle a number or NA for every item.

My child:

1. Seems always in a big hurry to get from one place to another.

1 2 3 4 5 6 7 NA

2. Gets angry when told s/he has to go to bed.

1 2 3 4 5 6 7 NA

3. Is not very bothered by pain.

1 2 3 4 5 6 7 NA

4. Likes going down high slides or other adventurous activities.

1 2 3 4 5 6 7 NA

5. Notices the smoothness or roughness of objects s/he touches.

1 2 3 4 5 6 7 NA

6. Gets so worked up before an exciting event that s/he has trouble sitting still.

1 2 3 4 5 6 7 NA

7. Usually rushes into an activity without thinking about it.

1 2 3 4 5 6 7 NA

8. Cries sadly when a favorite toy gets lost or broken.

1 2 3 4 5 6 7 NA

9. Becomes quite uncomfortable when cold and/or wet.

1 2 3 4 5 6 7 NA

10. Likes to play so wild and recklessly that s/he might get hurt.

1 2 3 4 5 6 7 NA

11. Seems to be at ease with almost any person.

1 2 3 4 5 6 7 NA

12. Tends to run rather than walk from room to room.

1 2 3 4 5 6 7 NA

My child:

13. Notices it when parents are wearing new clothing.

1 2 3 4 5 6 7 NA

14. Has temper tantrums when s/he doesn't get what s/he wants.

1 2 3 4 5 6 7 NA

15. Gets very enthusiastic about the things s/he does

1 2 3 4 5 6 7 NA

16. When practicing an activity, has a hard time keeping her/his mind on it.

1 2 3 4 5 6 7 NA

17. Is afraid of burglars or the "boogie man."

1 2 3 4 5 6 7 NA

18. When outside, often sits quietly.

1 2 3 4 5 6 7 NA

19. Enjoys funny stories but usually doesn't laugh at them.

1 2 3 4 5 6 7 NA

20. Tends to become sad if the family's plans don't work out.

1 2 3 4 5 6 7 NA

21. Will move from one task to another without completing any of them.

1 2 3 4 5 6 7 NA

22. Moves about actively (runs, climbs, jumps) when playing in the house.

1 2 3 4 5 6 7 NA

23. Is afraid of loud noises.

1 2 3 4 5 6 7 NA

24. Seems to listen to even quiet sounds.

1 2 3 4 5 6 7 NA

My child:

25. Has a hard time settling down after an exciting activity.

1 2 3 4 5 6 7 NA

26. Enjoys taking warm baths.

1 2 3 4 5 6 7 NA

27. Seems to feel depressed when unable to accomplish some task.

1 2 3 4 5 6 7 NA

28. Often rushes into new situations.

1 2 3 4 5 6 7 NA

29. Is quite upset by a little cut or bruise.

1 2 3 4 5 6 7 NA

30. Gets quite frustrated when prevented from doing something s/he wants to do.

1 2 3 4 5 6 7 NA

31. Becomes upset when loved relatives or friends are getting ready to leave following a visit.

1 2 3 4 5 6 7 NA

32. Comments when a parent has changed his/her appearance.

1 2 3 4 5 6 7 NA

33. Enjoys activities such as being chased, spun around by the arms, etc.

1 2 3 4 5 6 7 NA

34. When angry about something, s/he tends to stay upset for ten minutes or longer.

1 2 3 4 5 6 7 NA

35. Is not afraid of the dark.

1 2 3 4 5 6 7 NA

36. Takes a long time in approaching new situations.

1 2 3 4 5 6 7 NA

My child:

37. Is sometimes shy even around people s/he has known a long time.

1 2 3 4 5 6 7 NA

38. Can wait before entering into new activities if s/he is asked to.

1 2 3 4 5 6 7 NA

39. Enjoys "snuggling up" next to a parent or babysitter.

1 2 3 4 5 6 7 NA

40. Gets angry when s/he can't find something s/he wants to play with.

1 2 3 4 5 6 7 NA

41. Is afraid of fire.

1 2 3 4 5 6 7 NA

42. Sometimes seems nervous when talking to adults s/he has just met.

1 2 3 4 5 6 7 NA

43. Is slow and unhurried in deciding what to do next.

1 2 3 4 5 6 7 NA

44. Changes from being upset to feeling much better within a few minutes.

1 2 3 4 5 6 7 NA

45. Prepares for trips and outings by planning things s/he will need..

1 2 3 4 5 6 7 NA

46. Becomes very excited while planning for trips.

1 2 3 4 5 6 7 NA

47. Is quickly aware of some new item in the living room.

1 2 3 4 5 6 7 NA

48. Hardly ever laughs out loud during play with other children.

1 2 3 4 5 6 7 NA

My child:

49. Is not very upset at minor cuts or bruises.

1 2 3 4 5 6 7 NA

50. Prefers quiet activities to active games.

1 2 3 4 5 6 7 NA

51. Tends to say the first thing that comes to mind, without stopping to think about it.

1 2 3 4 5 6 7 NA

52. Acts shy around new people.

1 2 3 4 5 6 7 NA

53. Has trouble sitting still when s/he is told to (at movies, church, etc.).

1 2 3 4 5 6 7 NA

54. Rarely cries when s/he hears a sad story.

1 2 3 4 5 6 7 NA

55. Sometimes smiles or giggles playing by her/himself.

1 2 3 4 5 6 7 NA

56. Rarely becomes upset when watching a sad event in a TV show.

1 2 3 4 5 6 7 NA

57. Enjoys just being talked to.

1 2 3 4 5 6 7 NA

58. Becomes very excited before an outing (e.g., picnic, party).

1 2 3 4 5 6 7 NA

59. If upset, cheers up quickly when s/he thinks about something else.

1 2 3 4 5 6 7 NA

60. Is comfortable asking other children to play.

1 2 3 4 5 6 7 NA

My child:

61. Rarely gets upset when told s/he has to go to bed.

1 2 3 4 5 6 7 NA

62. When drawing or coloring in a book, shows strong concentration.

1 2 3 4 5 6 7 NA

63. Is afraid of the dark.

1 2 3 4 5 6 7 NA

64. Is likely to cry when even a little bit hurt.

1 2 3 4 5 6 7 NA

65. Enjoys looking at picture books.

1 2 3 4 5 6 7 NA

66. Is easy to soothe when s/he is upset.

1 2 3 4 5 6 7 NA

67. Is good at following instructions.

1 2 3 4 5 6 7 NA

68. Is rarely frightened by "monsters" seen on TV or at movies.

1 2 3 4 5 6 7 NA

69. Likes to go high and fast when pushed on a swing.

1 2 3 4 5 6 7 NA

70. Sometimes turns away shyly from new acquaintances.

1 2 3 4 5 6 7 NA

71. When building or putting something together, becomes very involved in what s/he is doing, and works for long periods.

1 2 3 4 5 6 7 NA

72. Likes being sung to.

1 2 3 4 5 6 7 NA

My child:

73. Approaches places s/he has been told are dangerous slowly and cautiously.

1 2 3 4 5 6 7 NA

74. Rarely becomes discouraged when s/he has trouble making something work.

1 2 3 4 5 6 7 NA

75. Is very difficult to soothe when s/he has become upset.

1 2 3 4 5 6 7 NA

76. Likes the sound of words, such as nursery rhymes.

1 2 3 4 5 6 7 NA

77. Smiles a lot at people s/he likes.

1 2 3 4 5 6 7 NA

78. Dislikes rough and rowdy games.

1 2 3 4 5 6 7 NA

79. Often laughs out loud in play with other children.

1 2 3 4 5 6 7 NA

80. Rarely laughs aloud while watching TV or movie comedies.

1 2 3 4 5 6 7 NA

81. Can easily stop an activity when s/he is told "no."

1 2 3 4 5 6 7 NA

82. Is among the last children to try out a new activity.

1 2 3 4 5 6 7 NA

83. Doesn't usually notice odors such as perfume, smoke, cooking, etc.

1 2 3 4 5 6 7 NA

84. Is easily distracted when listening to a story.

1 2 3 4 5 6 7 NA

My child:

85. Is full of energy, even in the evening.

1 2 3 4 5 6 7 NA

86. Enjoys sitting on parent's lap.

1 2 3 4 5 6 7 NA

87. Gets angry when called in from play before s/he is ready to quit.

1 2 3 4 5 6 7 NA

88. Enjoys riding a tricycle or bicycle fast and recklessly.

1 2 3 4 5 6 7 NA

89. Sometimes becomes absorbed in a picture book and looks at it for a long time.

1 2 3 4 5 6 7 NA

90. Remains pretty calm about upcoming desserts like ice cream.

1 2 3 4 5 6 7 NA

91. Hardly ever complains when ill with a cold.

1 2 3 4 5 6 7 NA

92. Looks forward to family outings, but does not get too excited about them.

1 2 3 4 5 6 7 NA

93. Likes to sit quietly and watch people do things.

1 2 3 4 5 6 7 NA

94. Enjoys gentle rhythmic activities, such as rocking or swaying.

1 2 3 4 5 6 7 NA

Please
check back to make sure you have completed all the pages of the questionnaire. Thank you
very much for your help!

APPENDIX J

CHILDREN'S SOCIAL UNDERSTANDING SCALE

Staff use: Subj. No. _____

Children's Social Understanding Scale (Long Form)

Today's Date _____ Sex of Child M F (Please circle one)

Child's Date of Birth _____ Age of Child _____ Yrs/ _____ Mo.s
Month Day Year (Years) (Months)

Your Relationship to Child Number of Siblings _____

Mother _____ Father _____ Ages of Siblings _____

Other: (please indicate relationship) _____

Instructions: Please read carefully before beginning:

On the following pages you will see statements that describe children's everyday behaviors and thinking. We would like you to tell us how well each statement describes your child's behavior and/or thinking. There are no "correct" answers. The skills and behaviors described in the statements develop gradually, and children differ widely in their behavior and ways of thinking. It is these differences we hope to learn about.

Please read each statement and decide whether it's a "True" or "Untrue" description of your child's thinking and behavior. Use the following scale to indicate how well a statement describes your child:

- Circle # If the statement is:
1 Definitely Untrue
2 Somewhat Untrue
3 Somewhat True
4 Definitely True

Please do your best to respond to all of the items. However, if you cannot answer an item because you have no idea whether your child thinks or behaves in that way, then circle "Don't Know" (DK).

Please be sure to respond by circling a number or "Don't Know" for every item.

Thank you for helping us learn more about children's development!

	My Child...	Definitely <u>Untrue</u>	Somewhat <u>Untrue</u>	Somewhat <u>True</u>	Definitely <u>True</u>	Don't Know
1	Talks about differences in what people like or want (e.g., "You like coffee but I like juice").	1	2	3	4	DK
2	Tries to understand the emotions of other people (e.g., wants to know why you are crying).	1	2	3	4	DK
3	Uses words that express uncertainty (e.g., "We might go to the park"; "Maybe my shoes are outside").	1	2	3	4	DK
4	Understands when s/he is being teased or made fun of.	1	2	3	4	DK
5	Thinks you can still see an object even if you are looking in the opposite direction.	1	2	3	4	DK
6	Is good at playing tricks on others (e.g., acts as if the cookie jar is empty when really it is full).	1	2	3	4	DK
7	Realizes that experts are more knowledgeable than others in their specialty (e.g., understands that doctors know more than others about treating illness).	1	2	3	4	DK
8	Talks about how people feel (e.g., "I'm happy"; "She's angry").	1	2	3	4	DK
9	Talks about what people like or want (e.g., "He likes cookies"; "She wants to go home").	1	2	3	4	DK
10	Understands that wishes do not always come true.	1	2	3	4	DK
11	Can tell you how s/he found out about things (e.g., "Sally told me about it"; "I saw it happen at the park"; "I heard it on the radio").	1	2	3	4	DK
12	Has trouble figuring out whether you are being serious or just joking.	1	2	3	4	DK
13	Recognizes that if a person wants something, that person will probably try to get it.	1	2	3	4	DK
14	Is good at playing "hide and seek" (e.g., is hard to find, does not make give-away noises).	1	2	3	4	DK
15	Talks about what people see or hear (e.g., "I see a duck"; "She hears a train coming").	1	2	3	4	DK
16	Talks about what people think or believe (e.g., "I think it's raining"; "He thinks it's bedtime").	1	2	3	4	DK

My Child...	Definitely <u>Untrue</u>	Somewhat <u>Untrue</u>	Somewhat <u>True</u>	Definitely <u>True</u>	Don't Know
17 Talks about differences between her/his beliefs and someone else's (e.g., "You think it's a shark but I think it's a dolphin").	1	2	3	4	DK
18 Talks about how her/his beliefs have changed over time (e.g., "I used to think that drinking from a cup is hard, now I think it's easy").	1	2	3	4	DK
19 Talks about people's mistaken beliefs (e.g., "He thought it was a dog but it was really a cat"; "I thought mommy was coming but it was really daddy").	1	2	3	4	DK
20 Realizes that if s/he does something bad, others may get mad.	1	2	3	4	DK
21 Understands that hurting others on purpose is worse than hurting others accidentally.	1	2	3	4	DK
22 Talks about people's intentions (e.g., "He did it on purpose"; "I didn't mean to spill it"; "She's trying to catch the kitten").	1	2	3	4	DK
23 Understands that just because you want something it does not mean you really need it.	1	2	3	4	DK
24 When given an undesirable gift, pretends to like it so as not to hurt the other person's feelings.	1	2	3	4	DK
25 When talking on the phone, behaves as if the listener can actually see her/him (e.g., assumes that the listener knows what s/he is wearing).	1	2	3	4	DK
26 Understands the difference between doing something intentionally and doing it by mistake (e.g., someone deliberately taking a toy vs. taking it by mistake).	1	2	3	4	DK
27 Understands that different people can have different feelings about the same thing (e.g., one child likes a dog but another child is scared of it).	1	2	3	4	DK
28 Talks about teaching and learning (e.g., says "My dad taught me how to play that game"; "I learned that song at daycare").	1	2	3	4	DK
29 Understands that people can perform the same action for different reasons (e.g., throwing a ball could be done with the intention of playing a game vs. with the intention of hurting someone).	1	2	3	4	DK

My Child...	Definitely <u>Untrue</u>	Somewhat <u>Untrue</u>	Somewhat <u>True</u>	Definitely <u>True</u>	Don't Know
30 Takes into account what others want (e.g., takes turns, shares toys, compromises with other children regarding which game to play).	1	2	3	4	DK
31 Tries to persuade others that their point of view is incorrect.	1	2	3	4	DK
32 Talks about the difference between the way things look and how they really are (e.g., "It looks like a snake but it's really a lizard").	1	2	3	4	DK
33 Talks about conflicting emotions (e.g., "I am happy to go on vacation, but I am sad about leaving friends behind").	1	2	3	4	DK
34 Is good at directing people's attention (e.g., points at things to get others to look at them).	1	2	3	4	DK
35 Tells lies that are really easy to discover (e.g., says that s/he did not eat a cookie when there's chocolate all over her/his face).	1	2	3	4	DK
36 Talks about the difference between intentions and outcomes (e.g., "He tried to open the door but it was locked").	1	2	3	4	DK
37 Is good at explaining things to younger children.	1	2	3	4	DK
38 Understands that telling lies can mislead other people.	1	2	3	4	DK
39 Thinks that s/he cannot be seen if her/his eyes are closed.	1	2	3	4	DK
40 Talks about the difference between what people want and what they actually get (e.g., "She wanted a puppy but she got a kitten").	1	2	3	4	DK
41 Has difficulty figuring out how you feel from your tone of voice or facial expressions of emotions (e.g., has trouble telling the difference between an angry and a sad voice/face).	1	2	3	4	DK
42 Talks about what people know or don't know (e.g., "I know who it is"; "He doesn't know where his ball is").	1	2	3	4	DK

Please check that you have answered all questions!

THANK YOU!!!

The Children's Social Understanding Scale (CSUS) Long Form

Scoring Instructions

Scale and subscale scores for the Children's Social Understanding Scale represent the mean score of all completed items within the scale or subscale. Subscale scores are computed as follows:

Sum all item responses for a given scale (or subscale) and divide the total by number of items receiving a score.

- * If the parent skipped an item, that item receives no score and is coded as missing.
- * If the parent chose "Don't Know" as a response to an item, it is coded as missing.
- * Items indicated with an R are reverse items and must be scored in the following way:

4 becomes 1

3 becomes 2

2 becomes 3

1 becomes 4

Items in Each Subscale

Belief:

6, 16, 17, 18, 19, 31, 38

Knowledge:

3, 7, 11, 14, 28, 37, 42

Perception:

5 (R), 15, 25 (R), 32, 34, 35 (R), 39 (R)

Desire:

1, 9, 10, 13, 23, 30, 40

Intention:

4, 12 (R), 21, 22, 26, 29, 36

Emotion:

2, 8, 20, 24, 27, 33, 41 (R)

APPENDIX K

BEHAVIOR RATING INVENTORY OF EXECUTIVE FUNCTION-
PRESCHOOL

SURVEY #4:

On the following pages is a list of statements that describe children. We would like to know if your child has had problems with these behaviors over the past 6 months. Please answer all the items the best you can. Please **DO NOT SKIP ANY ITEMS**. Think about your child as you read each statement and select your response:

- Never if the behavior is Never a problem.
- Sometimes if the behavior is Sometimes a problem.
- Often if the behavior is Often a problem.

During the past 6 months, how often has each of the following behaviors been a *problem*?

Please do your best to respond to all of the items. Thank you for helping us learn more about the children's development!

Press the "next" key when you are ready to begin.

During the past 6 months, how often has each of the following behaviors been a problem?

Overreacts to small problems

Never

Sometimes

Always

When given two things to do, remembers only the first or last

Never

Sometimes

Always

Is unaware of how his/her behavior affects or bothers others

Never

Sometimes

Always

When instructed to clean up, puts things away in a disorganized, random way

Never

Sometimes

Always

Becomes upset with new situations

Never

Sometimes

Always

Has explosive, angry outbursts

Never

Sometimes

Always

Has trouble carrying out the actions needed to complete tasks (such as trying one puzzle piece at a time, cleaning up to earn a reward)

Never

Sometimes

Always

Does not stop laughing at funny things or events when others stop

Never

Sometimes

Always

Needs to be told to begin a task even when willing to do it

Never

Sometimes

Always

Has trouble adjusting to new people (such as babysitter, teacher, friend, or day care worker)

Never

Sometimes

Always

Becomes upset too easily

Never

Sometimes

Always

Has trouble concentrating on games, puzzles, or play activities

Never

Sometimes

Always

Has to be more closely supervised than similar playmates

Never

Sometimes

Always

When sent to get something, forgets what he/she is supposed to get

Never

Sometimes

Always

Is upset by a change in plans or routine (for example, order of daily activities, adding last minute errands to schedule, change in driving route to store)

Never

Sometimes

Always

Has outbursts for little reason

Never

Sometimes

Always

Repeats the same mistakes over and over even after help is given

Never

Sometimes

Always

Acts wilder or sillier than others in groups (such as birthday parties, play group)

Never

Sometimes

Always

Cannot find clothes, shoes, toys, or books even when he/she has been given specific instructions

Never

Sometimes

Always

Takes a long time to feel comfortable in new places or situations (such as visiting distant relatives or new friends)

Never

Sometimes

Always

Mood changes frequently

Never

Sometimes

Always

Makes silly mistakes on things he/she can do

Never

Sometimes

Always

Is fidgety, restless, or squirmy

Never

Sometimes

Always

Has trouble following established routines for sleeping, eating, or play activities

Never

Sometimes

Always

Is bothered by loud noises, bright lights, or certain smells

Never

Sometimes

Always

Small events trigger big reactions

Never

Sometimes

Always

Has trouble with activities or tasks that have more than one step

Never

Sometimes

Always

Is impulsive

Never

Sometimes

Always

Has trouble thinking of a different way to solve a problem or complete an activity when stuck

Never

Sometimes

Always

Is disturbed by changes in the environment (such as new furniture, things in room moved around, or new clothes)

Never

Sometimes

Always

Angry or tearful outbursts are intense but end suddenly

Never

Sometimes

Always

Needs help from adult to stay on task

Never

Sometimes

Always

Does not notice when his/her behavior causes negative reactions

Never

Sometimes

Always

Leaves messes that others have to clean up even after instruction

Never

Sometimes

Always

Has trouble changing activities

Never

Sometimes

Always

Reacts more strongly to situations than other children

Never

Sometimes

Always

Forgets what he/she is doing in the middle of an activity

Never

Sometimes

Always

Does not realize that certain actions bother others

Never

Sometimes

Always

Gets caught up in the small details of a task or situation and misses the main idea

Never

Sometimes

Always

Has trouble "joining in" at unfamiliar social events (such as birthday parties, picnics, holiday gatherings)

Never

Sometimes

Always

Is easily overwhelmed or overstimulated by typical daily activities

Never

Sometimes

Always

Has trouble finishing tasks (such as games, puzzles, pretend play activities)

Never

Sometimes

Always

Gets out of control more than playmates

Never

Sometimes

Always

Cannot find things in room or play area even when given specific instructions

Never

Sometimes

Always

Resists change of routine, foods, places, etc.

Never

Sometimes

Always

After having a problem, will stay disappointed for a long time

Never

Sometimes

Always

Cannot stay on the same topic when talking

Never

Sometimes

Always

Talks or plays too loudly

Never

Sometimes

Always

Does not complete tasks even after given directions

Never

Sometimes

Always

Acts overwhelmed or overstimulated in crowded, busy situations (such as lots of noise, activity, or people)

Never

Sometimes

Always

Has trouble getting started on activities or tasks even after instructed

Never

Sometimes

Always

Acts too wild or out of control

Never

Sometimes

Always

Does not try as hard as his/her ability on activities

Never

Sometimes

Always

Has trouble putting the brakes on his/her actions even after being asked

Never

Sometimes

Always

Unable to finish describing an event, person, or story

Never

Sometimes

Always

Completes tasks or activities too quickly

Never

Sometimes

Always

Is unaware when he/she does well and not well

Never

Sometimes

Always

Gets easily sidetracked during activities

Never

Sometimes

Always

Has trouble remembering something, even after a brief period of time

Never

Sometimes

Always

Becomes too silly

Never

Sometimes

Always

Has a short attention span

Never

Sometimes

Always

Plays carelessly or recklessly in situations where he/she could be hurt (such as playground, swimming pool)

Never

Sometimes

Always

Is unaware when he/she performs a task right or wrong

Never

Sometimes

Always

APPENDIX L

BEHAVIOR RATING INVENTORY OF EXECUTIVE FUNCTION

SURVEY #4:

On the following pages is a list of statements that describe children. We would like to know if your child has had problems with these behaviors over the past 6 months. Please answer all the items the best you can. Please **DO NOT SKIP ANY ITEMS**. Think about your child as you read each statement and select your response:

Never if the behavior is Never a problem.
Sometimes if the behavior is Sometimes a problem.
Often if the behavior is Often a problem.

During the past 6 months, how often has each of the following behaviors been a problem?

Please do your best to respond to all of the items. Thank you for helping us learn more about the children's development!

Press the "next" key when you are ready to begin.

During the past 6 months, how often has each of the following behaviors been a problem?

Overreacts to small problems

Never

Sometimes

Always

When given two things to do, remembers only the first or last

Never

Sometimes

Always

Is not a self-starter			
Never	Sometimes	Always	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Leaves playroom a mess			
Never	Sometimes	Always	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Resists or has trouble accepting a different way to solve a problem with schoolwork, friends, chores, etc.			
Never	Sometimes	Always	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Becomes upset with new situations			
Never	Sometimes	Always	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Has explosive, angry outbursts			
Never	Sometimes	Always	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Tries the same approach to a problem over and over even when it does not work			
Never	Sometimes	Always	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Has a short attention span			
Never	Sometimes	Always	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	

Needs to be told to begin a task even when willing

Never

Sometimes

Always

Does not bring home homework, assignment sheets, materials, etc.

Never

Sometimes

Always

Acts upset by a change in plans

Never

Sometimes

Always

Is disturbed by change of teacher or class

Never

Sometimes

Always

Does not check work for mistakes

Never

Sometimes

Always

Has good ideas but cannot get them on paper

Never

Sometimes

Always

Has trouble coming up with ideas for what to do in play or free time

Never

Sometimes

Always

Has trouble concentrating on chores, schoolwork, etc.	Never <input type="radio"/>	Sometimes <input type="radio"/>	Always <input type="radio"/>
Does not connect doing tonight's homework with grades	Never <input type="radio"/>	Sometimes <input type="radio"/>	Always <input type="radio"/>
Is easily distracted by noises, activity, sights, etc.	Never <input type="radio"/>	Sometimes <input type="radio"/>	Always <input type="radio"/>
Becomes tearful easily	Never <input type="radio"/>	Sometimes <input type="radio"/>	Always <input type="radio"/>
Makes careless errors	Never <input type="radio"/>	Sometimes <input type="radio"/>	Always <input type="radio"/>
Forgets to hand in homework, even when completed	Never <input type="radio"/>	Sometimes <input type="radio"/>	Always <input type="radio"/>
Resists change of routine, foods, places, etc.	Never <input type="radio"/>	Sometimes <input type="radio"/>	Always <input type="radio"/>

Has trouble with chores or tasks that have more than one step

Never

Sometimes

Always

Has outbursts for little reason

Never

Sometimes

Always

Mood changes frequently

Never

Sometimes

Always

Needs help from an adult to stay on task

Never

Sometimes

Always

Gets caught up in details and misses the big picture

Never

Sometimes

Always

Keeps room messy

Never

Sometimes

Always

Has trouble getting used to new situations (classes, groups, friends)

Never

Sometimes

Always

Has poor handwriting

Never

Sometimes

Always

Forgets what he/she was doing

Never

Sometimes

Always

When sent to get something, forgets what he/she is supposed to get

Never

Sometimes

Always

Is unaware of how his/her behavior affects or bothers others

Never

Sometimes

Always

Has good ideas but does not get the job done (lacks follow through)

Never

Sometimes

Always

Becomes overwhelmed by large assignments

Never

Sometimes

Always

Has trouble finishing tasks (chores, homework)

Never

Sometimes

Always

Acts wilder or sillier than others in groups (birthdays parties, recess)

Never

Sometimes

Always

Thinks too much about the same topic

Never

Sometimes

Always

Underestimates time needed to finish tasks

Never

Sometimes

Always

Interrupts others

Never

Sometimes

Always

Does not notice when his/her behavior causes negative reactions

Never

Sometimes

Always

Gets out of seat at the wrong times

Never

Sometimes

Always

Gets out of control more than friends

Never

Sometimes

Always

Reacts more strongly to situations than other children

Never

Sometimes

Always

Starts assignments or chores at the last minute

Never

Sometimes

Always

Has trouble getting started on homework or chores

Never

Sometimes

Always

Has trouble organizing activities with friends

Never

Sometimes

Always

Blurts things out

Never

Sometimes

Always

Mood is easily influenced by the situation

Never

Sometimes

Always

Does not plan ahead for school assignments

Never

Sometimes

Always

Has poor understanding of own strengths and weaknesses

Never

Sometimes

Always

Written work is poorly organized

Never

Sometimes

Always

Acts too wild or "out of control"

Never

Sometimes

Always

Has trouble putting the brakes on his/her actions

Never

Sometimes

Always

Gets in trouble if not supervised by an adult

Never

Sometimes

Always

Has trouble remembering things, even for a few minutes

Never

Sometimes

Always

Has trouble carrying out the actions needed to reach goals (saving money for special item,
studying to get a good grade)

Never

Sometimes

Always

Becomes too silly

Never

Sometimes

Always

Work is sloppy

Never

Sometimes

Always

Does not take initiative

Never

Sometimes

Always

Angry or tearful outbursts are intense but end suddenly

Never

Sometimes

Always

Does not realize that certain actions bother others

Never

Sometimes

Always

Small events trigger big reactions

Never

Sometimes

Always

Talks at the wrong time

Never

Sometimes

Always

Complains there is nothing to do

Never

Sometimes

Always

Cannot find things in room or school desk

Never

Sometimes

Always

Leaves a trail of belongings wherever he/she goes

Never

Sometimes

Always

Leaves messes that others have to clean up

Never

Sometimes

Always

Becomes upset too easily

Never

Sometimes

Always

Lies around the house a lot ("couch potato")

Never

Sometimes

Always

Has a messy closet

Never

Sometimes

Always

Has trouble waiting for turn

Never

Sometimes

Always

Loses lunch box, lunch money, permission slips, homework, etc.

Never

Sometimes

Always

Cannot find clothes, glasses, shoes, toys, books, pencils, etc.

Never

Sometimes

Always

Tests poorly even when knows correct answers

Never

Sometimes

Always

Does not finish long-term projects

Never

Sometimes

Always

Has to be closely supervised

Never

Sometimes

Always

Does not think before doing

Never

Sometimes

Always

Has trouble moving from one activity to another	Never	Sometimes	Always
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is fidgety	Never	Sometimes	Always
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is impulsive	Never	Sometimes	Always
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cannot stay on the same topic when talking	Never	Sometimes	Always
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gets stuck on one topic or activity	Never	Sometimes	Always
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Says the same things over and over	Never	Sometimes	Always
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Has trouble getting through morning routine in getting ready for school	Never	Sometimes	Always
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDIX M

DEMOGRAPHICS QUESTIONNAIRE

What is your relationship to the child participating in this study?

- Mother
- Father
- Step-Mother
- Step-Father
- Other
- I prefer not to answer

What is your gender:

- Male
- Female
- Other
- I prefer not to respond

What is your age:

- Please type your age below.
- I prefer not to respond

What is your race (please select all that apply):

- American Indian or Alaska Native
- Asian
- Black or African-American
- Native Hawaiian or Other Pacific Islander
- White
- Unknown
- I prefer not to respond

Your ethnicity:

- Hispanic or Latino
- Not Hispanic or Latino
- I prefer not to respond

In what country were you born?

- Please enter your country of birth.
- I prefer not to respond

If outside of the United States, at what age did you move to the United States? If you were born in the United States, enter 0.

- Please enter the age at which you moved to the United States.
- I prefer not to respond

Which country or culture do you most closely identify with?

- Please enter the country or culture with which you most closely identify.
- I prefer not to respond

Is English the first language you learned?

- Yes
- No
- I prefer not to respond

What is the first language that you learned (your native language)?

What other languages have you studied? Please specify how long ago you began studying that language and for how long you studied that language.

If you are uncomfortable answering this question please type "I prefer not to answer" in the text box. If you have never studied any other languages please type "none" or "N/A" in the text box.

Are you currently a student?

- Yes
- No
- I prefer not to answer

What is your current year of study?

- Freshman
- Sophomore
- Junior
- Senior
- Post-Baccalaureate
- Graduate Student
- I prefer not to answer

What school do you attend?

What is the highest level of school that you have completed as of today?

- Less than seventh grade
- Junior high school (9th grade)
- Partial high school (10th or 11th grade)
- High school graduate
- Partial college (at least one year) or specialized training
- Undergraduate college (Bachelor's degree)
- Graduate college (Master's or PhD)
- I prefer not to answer

What is your current occupation?

- Please enter your occupation.
- I am not currently employed.
- I prefer not to answer.

How long have you worked at this occupation?

- Please enter time worked at this occupation in years and months

- I prefer not to answer

What has been your primary occupation after 18 years of age in terms of years worked?

- Please enter your primary occupation after 18 years of age.

- I have not been employed after 18 years of age.

- I prefer not to answer

**What is the total income for your household before taxes and deductions in the last 12 months?
(Examples: Wages, child support, etc.)**

- \$0-\$5,000
- \$5,000-\$10,000
- \$10,000-\$15,000
- \$15,000-\$20,000
- \$20,000-\$25,000
- \$25,000-\$30,000
- \$30,000-\$35,000
- \$34,000-\$40,000
- \$40,000-\$50,000
- \$50,000-\$70,000
- Over \$70,000
- I prefer not to answer.
- Unknown

Does the child participating in this study have any other primary caregivers in his or her family?

- Yes
- No
- I prefer not to answer

What is this person's relationship to the child?

- Mother
- Father
- Step-Mother
- Step-Father
- Other
- I prefer not to answer

Do you share a household with this person?

- Yes
- No
- I prefer not to answer
- I don't know

What is this person's gender:

- Male
- Female
- Other
- I prefer not to respond

What is this person's age:

- Please type age below.
- I prefer not to respond

What is this person's race (please select all that apply):

- American Indian or Alaska Native
- Asian
- Black or African-American
- Native Hawaiian or Other Pacific Islander
- White
- Unknown
- I prefer not to respond

What is this person's ethnicity:

- Hispanic or Latino
- Not Hispanic or Latino
- I prefer not to respond

In what country was this person born?

- Please enter country of birth.
- I prefer not to respond

If outside of the United States, at what age did this person move to the United States? If born in the United States, enter 0.

- Please enter the age at which this person moved to the United States.
- I prefer not to respond

Which country or culture does this person most closely identify with?

- Please enter the country or culture with which this person most closely identifies.
- I prefer not to respond

Is English the first language this person learned?

- Yes
- No
- I prefer not to respond

What is the first language that this person learned (native language)?

What other languages has this person studied? Please specify how long ago he or she began studying that language and for how long he or she studied that language.

If you are uncomfortable answering this question please type "I prefer not to answer" in the text box. If this person has never studied any other languages please type "none" or "N/A" in the text box.

Is this person currently a student?

- Yes
- No
- I prefer not to answer

What is his or her current year of study?

- Freshman
- Sophomore
- Junior
- Senior
- Post-Baccalaureate
- Graduate Student
- I prefer not to answer

What school does this person attend?

What is the highest level of school that this person has completed as of today?

- Less than seventh grade
- Junior high school (9th grade)
- Partial high school (10th or 11th grade)
- High school graduate
- Partial college (at least one year) or specialized training
- Undergraduate college (Bachelor's degree)
- Graduate college (Master's or PhD)
- I prefer not to answer

What is this person's current occupation?

- Please enter occupation.
- Not currently employed.
- I prefer not to answer.

How long has this person worked at this occupation?

- Please enter time worked at this occupation in years and months
- I prefer not to answer

What has been this person's primary occupation after 18 years of age in terms of years worked?

- Please enter your primary occupation after 18 years of age.
- I have not been employed after 18 years of age.
- I prefer not to answer

What is the total income for this person's household before taxes and deductions in the last 12 months?

(Examples: Wages, child support, etc.)

- \$0-\$5,000
- \$5,000-\$10,000
- \$10,000-\$15,000
- \$15,000-\$20,000
- \$20,000-\$25,000
- \$25,000-\$30,000
- \$30,000-\$35,000
- \$34,000-\$40,000
- \$40,000-\$50,000
- \$50,000-\$70,000
- Over \$70,000
- I prefer not to answer.
- Unknown

We are interested in understanding more about your child's diagnostic history. Please answer the following questions regarding the child participating in the study today. If there are any questions you would rather not answer, please select the response "prefer not to answer."

Attention Deficit Disorder/Attention Deficit Hyperactivity Disorder

Has your child ever been diagnosed with ADD/ADHD?

- Yes
- No
- Prefer not to answer

At what age did s/he first get diagnosed (years)?

Have you ever had any concerns that your child might have ADD/ADHD?

- Yes
- No
- Prefer not to answer

Have teachers or doctors ever expressed concerns that your child might be at risk for ADD/ADHD?

- Yes
- No
- Prefer not to answer

**Does your child have any biological siblings or parents who have a diagnosis of ADD/ADHD?
If yes, please enter sibling or parent.**

- Yes
- No
- Prefer not to answer

Autism Spectrum Disorder (ASD)

Has your child ever been diagnosed with ASD?

- Yes
- No
- Prefer not to answer

At what age did s/he first get diagnosed (years)?

Have you ever had any concerns that your child might have ASD?

- Yes
- No
- Prefer not to answer

Have teachers or doctors ever expressed concerns that your child might be at risk for ASD?

- Yes
- No
- Prefer not to answer

Does your child have any biological siblings or parents who have a diagnosis of ASD?
If yes, please enter sibling or parent.

- Yes
- No
- Prefer not to answer

Developmental Delay

Has your child ever been diagnosed with a Developmental Delay?

- Yes
- No
- Prefer not to answer

At what age did s/he first get diagnosed (years)?

Have you ever had any concerns that your child might have a Developmental Delay?

- Yes
- No
- Prefer not to answer

Have teachers or doctors ever expressed concerns that your child might be at risk for a Developmental Delay?

- Yes
- No
- Prefer not to answer

Does your child have any biological siblings or parents who have a diagnosis of a Developmental Delay?

If yes, please enter sibling or parent.

- Yes
- No
- Prefer not to answer

Did your child experience any birth complications? If yes, please describe below.

- Yes
- No
- Prefer not to answer

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