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The Contributions of Parental Management Language to Executive Function in Preschool Children

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Abstract

This study investigated relations between preschoolers' emergent executive function skills and their interactions with parents, with particular focus on the verbal utterances parents use to guide children's behavior (i.e., management language). Parent-child dyads ($N = 127$) were videotaped during a structured play task and the frequency of two types of management language, Direction (high control) and Suggestion (low control), was observed. Children's executive function was assessed using the Head-Toes-Knees-Shoulders (HTKS) task. Latent growth modeling was used to investigate relations between management language and the development of children's executive function. Direction language (i.e., commands) was negatively associated with children's age three executive function but not significantly related to the rate of executive function development over time. Conversely, Suggestion language (i.e., questions and statements that offer children some degree of choice) was positively related to executive function at age three but negatively related to growth. The potential importance of management language as a parenting behavior that contributes to various aspects of children's self-regulation during preschool and kindergarten is discussed.

Keywords

executive function; self-regulation; preschool children; early parenting precursors; parent-child interactions

Individual differences and disparities in important school readiness skills such as executive functions are apparent among children before they begin school. These early differences have important consequences, as children with less sophisticated executive function skills

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often struggle to attend to, and manage their behavior appropriately during instruction at home and school. As a result, they miss opportunities to build early literacy and math competencies and are likely to fall behind peers throughout the elementary grades and beyond (Duncan et al., 2007; McClelland, Acock, & Morrison, 2006). Many interacting factors shape the early development of these critical skills, and a sizeable literature suggests that parenting is one of the most important (National Institute of Child Health and Human Development Early Child Care Research Network (NICHD ECCRN), 2004). However, the mechanisms through which parenting shapes learning-related skills such as executive function are not well understood (Bernier, Carlson, & Whipple, 2010). In the current study, we examined how one set of parents' management practices is associated with children's executive function development during preschool and the transition to kindergarten. Specifically, we developed a coding scheme to capture variability in parents' *management language*, the verbal utterances that parents use to guide and control their children's behavior.

The Nature and Importance of Executive Functions

As early as the first year of life, children begin to regulate their own attention and behavior using a group of cognitive skills termed executive functions (Blair & Ursache, 2011). The three main skills involved are working memory, inhibitory control, and cognitive flexibility; specifically, working memory helps with keeping instructions and information in mind and with planning (Gathercole & Pickering, 2000), inhibitory control helps individuals stop automatic strategies and behaviors (Rennie, Bull, & Diamond, 2004), and cognitive flexibility aids in purposefully shifting attention or behavior to accommodate changes in task demands (Davidson, Amso, Cruess Anderson, & Diamond, 2006; McClelland et al., 2007).

Executive functions make a unique contribution to both academic and social outcomes, helping children follow the rules of a board game, engage in imaginative play with peers, and raise their hands instead of calling out in class. Consequently, children who enter kindergarten with insufficient executive function skills are at much greater risk for peer rejection and lowered academic achievement (Blair & Razza, 2007; McClelland, Morrison, & Holmes, 2000; Müller, Lieberman, Frye, & Zelazo, 2008). For example, McClelland and colleagues (2006) found that when child IQ, age, ethnicity, and maternal education level were taken into account, learning-related skills including executive functions positively predicted students' reading and math skills in kindergarten, as well as their growth in these domains up to 6th grade. More recent analyses indicate that parent reports of children's ability to sustain attention and persist on a difficult task at age four predicts math and reading achievement at age 21 as well as the probability of completing a college degree by age 25 (accounting for age seven achievement, adopted status, child vocabulary skills, gender, and maternal education) (McClelland, Acock, Piccinin, Rhea, & Stallings, 2012). Moreover, several studies have indicated that poor executive function skills put children at risk for the development of externalizing problems, with executive function likely operating as a mediator between early experiences and later behavioral issues (Belsky, Pasco Fearon, & Bell, 2007; NICHD ECCRN, 2003).

Parenting and Children's Executive Function Development

Executive function skills are shaped by a complex interplay between environmental factors (e.g., parents, schooling, peers) and child characteristics including genetic influences, neurological development, and underlying temperament (Blair, 2006; Kochanska, Philibert, & Barry, 2009; Posner & Rothbart, 2000). The emergence of independent behavioral self-regulation begins between 12 and 36 months with the support of a number of emergent

skills: representational thinking and a sense of self; recall memory that helps children remember caregiver requests; and the emergent capacity for delaying behavior (Kopp, 1982). When considering the various environmental factors at play, evidence suggests that parents' guidance is one of the primary experiences contributing to children's executive function during the early childhood years (Landry & Smith, 2010; NICHD ECCRN, 2004, 2005). Sociocultural theory posits that executive function skills develop in the context of social interactions (Luria, 1961; Vygotsky, 1978), which introduce children to cultural tools such as language and symbols that extend and enhance their basic memory and attention skills (for a review of sociocultural theory and language as they apply to executive functions, see Winsler, 2009). Specifically, more skilled experts (often, for young children, their parents) provide scaffolding, or tailored assistance that allows the child to reach a level of executive function beyond what he or she could achieve alone (Vygotsky, 1978; Wood, Bruner, & Ross, 1976). For example, when teaching a child the rules of a new game involving inhibition or working memory (e.g., Simon Says), the parent might instruct the child to repeat the rule to him or herself so that when the game starts, the child can use repetition to remember the rule and perform the correct behavior.

Within this supportive context, executive functions emerge and evolve over the first years of life. By ages three and four, children who have had much exposure to parental guidance that both models appropriate conduct and encourages or demands appropriate attitudes and behavior have begun to internalize social norms and expectations (Bronson, 2000; Kochanska, Coy, & Murray, 2001; Vazsonyi & Huang, 2010).

Management language

One form of scaffolding that parents use on a daily basis in a variety of contexts is management language, a collection of statements, questions, and actions used to guide children's behavior. Kochanska and colleagues (Kochanska, 1992; Kochanska, Kuczynski, & Maguire, 1989; Kuczynski & Kochanska, 1990; Kuczynski, Kochanska, Radke-Yarrow, & Ginius-Brown, 1987) have observed and categorized several distinct types of management language, including commands, indirect commands (i.e., suggestions and questions), reasoning, praise, reprimands, and bargaining (i.e., negotiation). The management strategies mothers used had consequences for children's behavior: Directive maternal language was associated with more overt noncompliance from children, whereas reasoning and suggestions were associated with more negotiation on the part of the child (Kuczynski et al., 1987).

Management language may relate to children's executive function skills for a number of reasons. One function of management language is to provide structure, which is defined as parents' organization of the child's environment so that he or she can succeed (Grolnick & Pomerantz, 2009). Structure teaches children about the consequences of their actions and creates clear, consistent rules and contingencies for child behavior. In the case of an everyday executive function task such as waiting for dinner instead of eating a snack, a verbal reminder not to eat something right before dinner helps the child to understand family rules regarding snacking before meals as well as the consequences of having a snack right before dinner. Management language may thus also lead to better future performance in tasks that require executive function skill. Ultimately, children may internalize parents' management language as private speech, or self-talk that they use to guide and plan their own behaviors (Diaz et al., 1992; Winsler, 1998; Winsler, Diaz, & Montero, 1997). In the current study, we examine how parents use management language to help children organize their behavior to set up and complete an activity: a pretend birthday party.

It is important to consider that parents might use a range of management remarks, some of which might better support children's EF skills. At one end, parents might command

children's behaviors using pressure and dominance that interfere with children's autonomy; at the other end, parents might guide children while taking their perspectives and growing behavioral regulation into account, thereby fostering children's independence (Grolnick & Pomerantz, 2009). Although context is certainly important for interpretation, it is the case that physical enforcement, reprimands, and commands (direct, indirect, and unclear) generally reflect higher control, while suggestions, bargaining and explanations are autonomy supportive. Thus, parents' management language is an instrument through which parents provide (or prevent) choices and encourage (or discourage) children in taking an active role decision-making (Grolnick, Gurland, DeCoursey, & Jacob, 2002).

The existing literature sheds some light on how these various types of management language might be differentially linked to the development children's executive function skills. Research suggests that more controlling parental guidance, through strategies including but not limited to management language, can be detrimental to young children's effortful control, an alternate conceptualization of inhibition (Karreman, van Tuijl, van Aken, & Dekovic, 2008; Kochanska & Knaack, 2003). Conversely, autonomy-supportive practices (including but not limited to management language) foster executive function and related skills. For example, Bernier and colleagues (2010) found that maternal sensitivity and autonomy support observed when children were 12-15 months old were strongly correlated with children's executive function at 18 and 26 months, even when accounting for child cognition and maternal education. A second study partially confirmed these results, finding that autonomy support was a significant predictor of later EF skills when accounting for socioeconomic status (SES) and was actually a stronger predictor of EF than SES (Matte-Gagné & Bernier, 2011).

Narrowing the focus to management language in particular, a small body of previous empirical work hints at the unique contributions of management language to early executive functioning, but results are complex. When parents explicitly acknowledge children's needs and desires and emphasize children's control over their own behavior through explanations and reasoning, children's regulation of their own behavior increases (Kochanska & Aksan, 2006). The same patterns emerge when parents invite more negotiation and express more respect for children's autonomy (Estrada, Arsenio, Hess, & Holloway, 1987; Pianta, Nimetz, & Bennett, 1997; Pianta, Smith, & Reeve, 1991). In contrast, the role of controlling management language such as directives may be more nuanced. There is evidence that some directives from adults may help children develop their self-regulatory skills by teaching them about appropriate behaviors (Baldwin, 1955; Kopp, 1982). However, the use of many directives from caregivers may interfere with children's development of independent control (Landry, Smith, Swank, & Miller-Loncar, 2000). Moreover, research suggests that relations between parental management language and child behavior can be different for children with and without a history of behavior problems or ADHD (Winsler, Diaz, McCarthy, Atencio, & Chabay, 1999). Thus, the literature suggests that autonomy supportive management language can be helpful, but that the benefits of directives may depend upon the context.

Remaining Questions in the Field

Several issues remain ill-explained and add to the complexity of the extant research literature. First, most studies have included relatively few types of parents' management language. Although Kochanska's work illuminated a new, rich picture of parents' control and children's compliance, the relatively broad aims of that research (to explore managerial features of parent-child interactions and child compliance among families with either typical or depressed mothers) made it unnecessary to distinguish among a variety of "indirect commands," including polite commands, suggestions, or requests. In contrast to direct

commands, which provide a child with straightforward guidance (e.g., “Set the table”), indirect commands shape a child’s behavior but offer at least the appearance of some degree of choice. For example, a parent might say, “Do you want to set the table?” or “You could set the table now” or “Now, you can either set the table or fill up the water glasses.” Alternatively, in the course of daily life, the parent might simply ask the child what he or she wants to do (e.g., “What do you want to do now?”). These nuances in parents’ nondirective language may well be important in understanding how parenting is linked to executive function, as these strategies afford children different levels of control over an activity and thus may have different contributions to executive function. The current study endeavored to capture the frequency of both commands and suggestions, as well as to understand whether parents who used more of one type of management language also used more of the others, and to link this input to children’s executive function.

Second, child age – a strong indicator of children’s existing skills in EF–may play a role in how parents’ management language relates to children’s EF. For example, Landry and colleagues (2000) found that mothers who used many directives with their two-year-olds tended to have children with high levels of cognitive skills according to a broad measure of mental development; however, mothers who used high levels of directive language when their children were 3½ had children with poor EF-related skills at age 4½. These findings may suggest that maternal directives foster cognitive skills such as behavioral EF at young ages, but hinder them as children approach age four and are beginning to manage their own behavior. However, because different groups of cognitive skills were measured by Landry and colleagues at each time point, no conclusions can be drawn about how maternal language related to children’s concurrent executive function or growth of these skills. Further, no forms of indirect commands or suggestions were examined. Longitudinal work is needed to explore how a variety of types of parents’ management language actually predict EF development in children across the school transition period.

Finally, few studies have examined as their outcomes the cognitive EF skills that are the foundation for self-regulation (namely, working memory, inhibition, and cognitive flexibility). Instead, most studies have focused on compliance and social competence outcomes, which are a step removed from these more basic cognitive processes. In the current study, we use a valid and reliable measure of EF (the Head-Toes-Knees-Shoulders Task; Ponitz et al., 2008), a skill set that is fundamental to other aspects of self-control and to children’s future academic and social success.

Research Questions and Hypotheses

With these prior findings and remaining questions in mind, the current study sought to develop an observational scheme that goes beyond global rating scales to capture the nature of parents’ use of verbal utterances to control and manage children, and to relate this language to children’s development of EF over the preschool period. We took an approach similar to that of Kuczynski, Kochanska and colleagues (1987, 1989), who captured a wide variety of verbal and physical control behaviors during everyday home activities and also distinguished between positive or negative affective valences. However, because our interests involved understanding EF outcomes, we took a more nuanced look at a variety of more- and less-controlling language that explicitly encouraged or discouraged children to take part in decision making, with less attention to the affective quality of parents’ talk (which was relatively more important in the Kuczynski and Kochanska work). In our coding scheme, six types of parent management language were defined, based on the degree of choice that they grant the child when spoken by a parent. These ranged from Explicit Direction (i.e., directives that discouraged the child from negotiating or using autonomous

decision-making) to Transfer (i.e., remarks which invited the child to choose the next course of action). Three research questions framed our investigation of parents' language.

First, what is the nature and extent of the management language used by parents while engaging in a structured play activity with children? We hypothesized that parents would vary in the frequency of both directive and more autonomy-supportive management language, and thus the opportunities they offered children to participate in decision-making during a joint activity. Second, we also examined whether parents' management language use was related to several demographic variables including maternal education, child age, and child gender. Based on extant work regarding socioeconomic status, and the provision of language stimulation in the home, parents with less education were expected to use more directive management language than parents with more education (Hoff, Laursen, & Tardif, 2002). Parents of younger preschoolers were also expected to use more directive language than parents of older preschoolers because younger children have less capacity for regulating their own behavior and participating in decision-making (Landry et al., 2000). Also, past findings suggest that parents of sons will use more directive language than parents of daughters (Leaper, Anderson, & Sanders, 1998).

Third, how is parents' management language related to children's development of EF across the transition from preschool to kindergarten? Consistent with past research, we expected that parents who used high amounts of the more directive types of management language when children were in preschool (age 3) would have children with lower concurrent levels of EF. However, we predicted that parents who used these types of language, which offered children opportunities to make decisions about the activity at hand, would have children with higher EF skills at the start of preschool. Further, in light of prior work (Kopp 1982; Landry et al., 2000), we predicted that directive language early in development might actually foster EF growth, whereas large amounts of more suggestive forms of management language when children were three years old would be linked to slower EF growth through the transition to kindergarten.

Method

Participants

The data for the current study were collected from families in the Pathways to Literacy Project, a 5-year longitudinal study of early academic and social development (Hindman & Morrison, 2012). The project was conducted in an urban fringe area near a major Midwestern city. During two consecutive years, all 3- and 4-year-old preschoolers in one public school district were recruited at fall orientations and through backpack mailings. Approximately 50% of all eligible children and families consented to participate in the larger study ($n = 412$ children). A subsample of children ($n = 127$) were included in the current study of executive function, as they met two criteria (i.e., participated in a home visit before kindergarten and spoke English at home).

According to parent reports, approximately half ($n = 65$) of participating children were female. Most ($n = 121$) parents who participated in the home visit portion of the study were mothers. The majority (70%) of children were White; three percent were African-American or biracial; seven percent were East Indian or Asian; eight percent were Arabic, Chaldean, or Middle Eastern; and 12% did not identify.

The recruitment strategy, which targeted both 3- and 4-year-olds, resulted in two patterns of enrollment. Some children ($n = 79$) were in their first year of preschool (approximately age 3) during the first year of the Pathways study, so when their home visit occurred during the following summer, they were in between years 1 and 2 of preschool. The second group of

children ($n = 48$) were beginning their second year of preschool at the start of the Pathways study, so that when their summer home visit occurred, they were in between preschool and kindergarten. Because of this variability, we included year of preschool at study entry and age at home visit as covariates in all analyses relating management language and EF.

Procedure

Data collection occurred both in the home and at school. Children's executive function was assessed by trained research assistants at school during the fall and spring of each academic year. Executive function assessments began in the first year of preschool (child age 3) and continued through spring of kindergarten. This meant that children who began the study as 3-year-olds had up to 6 executive function assessments and children who began as 4-year-olds had a maximum of 4 assessments. Due to missing data, the actual range was between 2 and 6 assessments ($M = 4.98$, $SD = 1.19$). Additional information regarding family demographics and parent management language was collected during an hour-long summer home visit that took place before pre-kindergarten or kindergarten.

Measures

Child and family demographic variables—During the home visit, parents completed a 10-minute Background Questionnaire regarding their education levels as well as child age, gender, ethnicity, and childcare and preschool experience. Parents completed the paper-and-pencil, English-language questionnaire independently and then mailed it to the research team.

Child executive function—Children's executive function was assessed by trained research assistants using the Head-Toes-Knees-Shoulders (HTKS) task. This measure, which is based on the work of McCabe and colleagues (McCabe, Rebello-Britto, Hernandez, & Brooks-Gunn, 2004), requires children to integrate the three cognitive skills involved in executive function: working memory, inhibitory control, and cognitive flexibility. In this structured observational assessment, children are first trained to touch their head or toes on command. Thereafter, the directions change so that children are asked to do the opposite of the instruction, which requires that they inhibit a prepotent response to perform correctly. In this way, children must integrate the cognitive components of executive function by (a) using working memory to remember the rules while completing the task, (b) inhibiting a dominant response in favor of a subdominant response, and (c) switching their responses as the items (touch your head, touch your toes) alternate. Research assistants administering the HTKS task were trained in several steps that included studying task protocols and discussing different scenarios and problems, watching a training video, practicing the assessment and demonstrating competency in assessing children before traveling to schools.

Two forms of the HTKS task were used over the course of the study. For all forms, an incorrect response was scored as zero points, an initially incorrect response that was immediately corrected (i.e., self-corrected) by the child was scored as one point, and a correct response was given a score of two points. Children in preschool received a 10-item form consisting of only 'head' and 'toes' items. For children in kindergarten and older (i.e., with more advanced skills), a more difficult 20-item version of the task was used in which children must also reverse directions including touching their knees or shoulders. Two versions of this more difficult form were used, identical except for counterbalancing the order of items. To place the various forms on the same measurement scale, responses were scaled with the Rasch rating scale model (Andrich, 1978; Rasch, 1980) using the Facets program (Linacre, 2010). Extreme scores (i.e., none or all correct) were adjusted in a manner consistent with standard practice in Rasch measurement in Facets, an approach that tends to yield approximately unbiased estimates of the latent trait for individuals with extreme scores

(Wright, 1998). Alternative methods for extreme scores, including deletion and statistical adjustment as implemented in Mplus (Muthén & Muthén, 2007) yielded identical results. Fit to the Rasch rating scale model was very good using Linacre and Wright's (1994) criteria. For ease of interpretation, the Rasch scores were re-scaled across all children and time points to have a mean of 0 and a standard deviation of 1. Thus, the meaning of the score remained constant across time points, revealing growth.

The HTKS has demonstrated validity, reliability, and variability in diverse samples of children ages 3 through 6 (Ponitz et al., 2008; Ponitz, McClelland, Matthews, & Morrison, 2009). Advantages of the HTKS task include its brevity (about 5 minutes); objectivity relative to teacher and parent ratings of children's behavior, which are potentially biased (McClelland et al., 2007; Ponitz et al., 2009); and lack of required materials. Finally, the HTKS task requires gross motor (rather than fine motor) movements, an important feature because the vast majority of children in preschool and beyond can perform these gross-motor actions easily, while their fine motor accuracy is confounded by many other skill sets and not necessarily indicative of executive function alone.

Parent Management Language—Data regarding parents' management language were collected using videos, taken during the home visit in the summer after preschool or pre-kindergarten, of children and parents engaging in a pretend birthday party task in the home. Parents and their children were given invitations, gift bag materials, and other props to act out the party from start to finish. The play task required 13 minutes on average ($M = 13:20$, min. = 04:54, max = 36:31) and was videotaped and coded for parent management language. Parents were simply asked to pretend to have a party with their child and were blind to the focus on management language in this study.

Parents' management-oriented utterances were coded using the following categories: (1) Explicit Direction, which includes statements that directly express commands (e.g., "Put the plate on the table"); (2) Qualified Direction, which are direction statements that are qualified by a final question (e.g., "I want you to help me with this, ok?"); (3) Ambiguous Suggestion, questions that are unclear as to whether or not they give the child a choice (e.g., "Do you want to start cleaning up?"); (4) Choice, or questions that provide the child with two or more alternatives ("Do you want to start setting up, or should we write the invitations first?"); (5) Single Suggestion, a comment that gives the child both a clear suggestion and a choice about whether to accept that suggestion (e.g., "Maybe we could try putting the napkins under the plates"); and (6) Transfer, featuring statements or questions which cede control of the situation to the child (e.g., "What should we do next?").

Management codes were assigned only to language focused upon managing children's behavior or the course of the activity; other content (such as labeling materials or discussing actual birthday parties children had previously attended) was not coded in the current study. Each management idea was coded individually regardless of sentence structure; if a parent used two similar or different management ideas in one sentence, each was counted separately. If management utterances were repeated consecutively with at least a 1-second pause between utterances, the utterances were counted separately.

Four trained coders (one master coder and three research assistants) coded the videos. All were blind to the hypotheses of the study. Inter-rater reliability was calculated using the Shrout-Fleiss Intraclass Correlation (ICC) coefficient for more than 10% of the videos coded (Shrout & Fleiss, 1979). The ICC for the identification of all types of management language among all other utterances was .88. The ICC for Explicit Direction was .83, Qualified Direction was .97, Ambiguous Suggestion was .83, Single Suggestion was .74 (likely due to

the relatively infrequent occurrence of this type of management language), Choice was .89, and Transfer was .93.

Results

Research Question 1

Descriptive statistics for parent management language and child executive function are presented in Table 1. All parents used at least some Explicit Direction, with the average parent using approximately 35 ($SD = 26.01$, range 10 to 170) such remarks throughout the activity. However, variation on this outcome was substantial, with the total number of remarks made by each parent ranging from 11 to 101 ($SD = 15.45$). The average parent also made about 16 Ambiguous Suggestions, although use of this kind of talk ranged from four to 63 instances ($SD = 10.00$). Relatively more moderate use of Transfer was observed, with the average parent employing this strategy eight times during the birthday party, although once again, variation across families was apparent ($SD = 5.50$, range = 1 to 38). Finally, relatively few instances of the other kinds of talk were observed, with the average family using Qualified Directions just a few times during the party ($M = 2.97$, $SD = 2.60$, range = 0.55 to 16.66), and using Single Suggestion or Choice less than twice ($M = 1.45$, $SD = 1.46$, range = 0.23 to 9.72, and $M = 0.61$, $SD = 0.97$, and range = 0.03 to 5.09, respectively). Each of the management language codes was positively skewed with an over-representation of zero values, as is to be expected from count data. Below we describe the accommodations that were made to ensure that these count variables were properly modeled.

Correlations between each of the management language types and the Rasch scaled executive function outcomes are listed in Table 4. An exploratory factor analysis with Maximum Likelihood Extraction and Geomin rotation (now standard in the Mplus software; Muthén & Muthén, 2007) was used to consolidate the raw data from the six types of management language into meaningful factors. Note that we treated the management language scores as continuous variables. Results were consistent when we considered the management language variables as counts using Poisson and zero-inflated Poisson modeling, and when we used a square root transformation. Results were also consistent for both the original scores and the square root transformation when we removed cases with scores on any of the six variables more than 2.5 SD above the mean. We report only the results from the simpler continuous modeling. Two factors were identified using several criteria, including Kaiser's rule (eigenvalues > 1 ; Kaiser, 1960), a scree plot, relative fit (2 factors vs. 1 factor, $\Delta\chi^2 = 30$, $\Delta df = 5$, $p < .01$), and absolute fit ($\chi^2 = 3$, $df = 4$, $p = .51$; RMSEA = .00).

Ambiguous Suggestion, Single Suggestion, Choice, and Transfer loaded onto the first factor, which was labeled Management-Suggestion. Explicit Direction and Qualified Direction loaded onto the second factor, labeled Management-Direction (Ambiguous Suggestion had a small cross-loading). A follow-up confirmatory factor analysis yielded standardized factor loadings for the Management-Suggestion factor of .73 for Ambiguous Suggestion, .19 for Single Suggestion, .41 for Choice, and .74 for Transfer. The standardized factor loadings on the Management-Direction factor were .79 for Explicit Direction and .50 for Qualified Direction.

We created simple indices of the factors by summing the scores of the indicators for each factor (i.e., Explicit Direction + Qualified Direction for the Management-Direction factor and Ambiguous Suggestion + Single Suggestion + Choice + Transfer for the Management-Suggestion factor). These indices were highly skewed, so we used a square-root transformation and then removed cases with scores on either index more than 2.5 SD above the mean (2 cases). The resulting variables did not deviate significantly from normality

according to the Kolmogorov-Smirnov test (Management-Direction: $K-S = .074$, $df = 127$, $p = .09$; Management-Suggestion: $K-S = .070$, $df = 127$, $p = .20$). We note that the pattern of results was the same when we used latent factors, the original indices without transformation, or did not remove outliers; ultimately, we report results from the square-root transformation of the indices with outliers removed, as these balanced normality assumptions and simplicity. To aid in interpretation, we converted the indices to z-scores, so that results are in standardized units.

Demographic predictors of management language—Child gender differences in the management language counts are included in Table 1. Zero-order correlations between maternal education, child age, management language, and executive function scores are presented in Table 2. A linear regression with maternal education, child age at the home visit, and child gender as predictors was used to predict the two major types of management language (See Table 3). Child age was negatively related to the amount of Direction used by parents ($b = -10.52$, $p = .002$) but maternal education and child gender were not significant predictors of Direction. None of the predictors was significantly related to Suggestion.

Research Question 2

Associations between the two management language indices and children's executive function growth over time were examined using growth curve modeling in a latent variable modeling framework in Mplus (Muthén & Muthén, 2007). This framework allows for both individually varying times of observation, in this case, age at observation (Curran, Obeidat, & Losardo, 2009; Raudenbush & Bryk, 2002) and management indices as predictors. The first analysis examined longitudinal growth in executive function. Repeated observations of executive function were modeled using a latent intercept term representing a child's initial level of executive function (set to age three), and a latent linear growth term representing a child's growth rate per year. Estimation of a quadratic growth curve did not converge. On average, children at age three had an executive function score of 1.11 *SD* below the mean over all children and occasions and grew by .63 *SD* per year.

We then considered a model in which the Management-Direction and Management-Suggestion indices were used to predict variation in the age three intercept and linear slope of children's executive function growth (See Figure 1). We included child gender, year of preschool at study entry, child age at home visit, and duration of the birthday party as covariates. None was a significant predictor either singularly or jointly (tested using a likelihood ratio test), so we report results from the analysis without the covariates for parsimony. Results showed that Management-Suggestion was significantly, positively related to children's executive function at age three, $b = 0.21$, $p = .02$. Conversely, Management-Suggestion was also found to be negatively related to executive function growth, $b = -.10$, $p < .01$. Thus, children who received higher amounts of Management-Suggestion during the birthday party task tended to have higher executive function at age three but showed slower growth as they approached and completed kindergarten. The findings with respect to Management-Direction language were essentially the opposite of those for Management-Suggestion. Management-Direction language was significantly, negatively associated with children's initial executive function level at age three, $b = -.23$, $p = .03$. It was also a positive predictor of executive function growth, but the relation was not significantly different from zero, $b = .05$, $p = .17$. Children who received more Management-Direction utterances during the birthday party task tended to have lower executive function skills at age three, but their rate of executive function growth across the transition to kindergarten was not connected to the frequency with which they heard these utterances.

As a final point, we examined the data to make sure that results were not artifacts of a ceiling effect on the HTKS scores. Using statistical methods for censored data, treating maximum scores as missing, and removing individuals with a maximum score at any occasion from the data did not have any impact on the results.

Discussion

The current study extends past findings regarding the impact of parental control and management by examining specific parental verbalizations within the context of a play activity in the home. This study provides a simple, straightforward measure of parental management strategies: an observational coding system that gauges how frequently parents use directives or provide opportunities for children to choose their next behavior or action.

The first goal of this study was to develop a coding scheme to capture variability in parents' use of management language, which is posited to be one of the primary means through which parents guide their children's behaviors and activities. The management language coding scheme revealed substantial variability in parents' use of six different types of directives, suggestions, and questions. A factor analysis revealed that, of the six types of management language that were originally coded, only two main types of utterances emerged: Direction (commands that do not solicit child input) and Suggestion (questions and comments that invite the child to make a choice or provide an opinion regarding the course of the activity). Descriptive data showed that across parents, the most common instance of Direction language involved dictating what children should do without qualification (e.g., "Cut the cake now"), whereas the most common instance of Suggestion language was Ambiguous Suggestion, which offered only one possible action and, thus, included at least some inherent pressure toward that stated action (e.g., "Do you want to go ahead and cut the cake?"). Other kinds of remarks, included Qualified Directions, Simple Suggestions, and Choices were used much less frequently. This coding scheme further differentiates among the types of parental language explored in prior work (Kochanska et al., 1989; Kuczynski et al., 1987) by examining the full range of directives and questions that occur during a joint play activity in the home. As such, it provides a portrait of the management techniques used by parents in this middle- to upper-income community. Moreover, the coding system reveals which kinds of language seem to be used together, and which (e.g., Explicit Direction vs. Ambiguous Suggestion) share some theoretical overlap but are actually empirically distinct in parents' repertoires of management strategies. Preliminary analyses indicated that demographic variables were not related to parents' use of Suggestion language, but that parents of younger children tended to use more Direction language than parents with older children.

The second goal of this study was to investigate the predictive value of management language for the development of children's executive function during the preschool years and the transition to kindergarten. Patterns of association were largely consistent with initial hypotheses, as children who received relatively high amounts of Direction tended to have lower EF skills at age three, whereas children who received more Suggestion tended to have higher EF at that early point in time. Regardless of initial skill level, all children showed substantial growth on our measure of EF. However, the use of Direction at age three was not significantly linked to executive function growth during preschool and kindergarten, while children who received high amounts of Suggestion grew at a significantly slower rate.

The observed negative association between Direction and children's initial EF skills at age three can be interpreted in several ways. First, direction may be ineffective as a strategy for fostering children's behavioral regulation, as this kind of language limits children's opportunities to make and execute choices. However, the finding that Direction was not

significantly associated with children's EF growth does not support this idea. Another explanation is that frequent use of directive language early in life is indicative of parents' response to children who demonstrate low EF. In this way, parents of three-year-olds with low EF might use management language that is more controlling, perhaps to remind and encourage children to manage their behavior, or to prevent children from behaving in inappropriate or impulsive ways. This interpretation is in line with past research, which suggests that mothers' teaching strategies (including commands, questioning, and cognitive assistance) when children are 30 and 42 months old are predicted by children's prior levels of effortful control (Eisenberg et al., 2010).

The same dual explanations are relevant for the finding that children who received relatively high amounts of Suggestion tended to have high initial levels of EF. On one hand, it is plausible that suggestions allow very young children to make choices in a structured and constrained way that is appropriate for their emerging language, cognitive, and attention skills. Alternatively, parents may have reacted to their high children's levels of behavioral control by providing more opportunities to make decisions and provide input into the activity.

Regarding change over time, the findings with respect to directive language shed light on the mixed conclusions of past studies of this type of parent utterance. The evidence that Direction language was negatively related to EF at age three, but not linked to preschool children's EF development over time, extends findings from Landry and colleagues (2000). Landry's work showed that directives when children were 3½ were negatively related to children's performance on an EF (i.e., goal-directed planning) task at age 4½. The current study was able to model change in the same measure of EF across several time points, showing that children with poor EF skills received many commands at age three, but that directive language did not seem to prevent them from developing EF skills.

In contrast, increased Suggestion language was associated with slower executive function growth. Whereas parents with children who have low executive function may use a lot of Direction language in the hopes of encouraging improvement in this area, parents who use a lot of Suggestion language might do so because they are satisfied with their child's level of executive function and simply want to maintain it. By providing more commands, parents of children with poor executive functions skills at age three may have helped their children catch up to their peers over time. Conversely, children who received more Suggestion language may have showed slightly slower growth because they had already developed many of the skills needed to succeed on the EF task. An additional, more nuanced possibility is that although Suggestion language offers some degree of choice, the specific kinds of Suggestion utterances most frequently captured during this activity may not have provided ideal opportunities for children to practice executive function as they grew older, because they tended to promote one particular course of action over others. Other kinds of Suggestion talk, such as transfer, might be most helpful in this area as children progress through the school transition period.

As a final note, it is possible that Suggestion language might be negatively related to children's executive function development because those children whose parents used this form of management had less room or need to grow in the types of executive function assessed in this study. The descriptive statistics indicate that growth on the HTKS measure slowed across the last two assessments, fall and spring of kindergarten. However, we carefully examined the possibility that a ceiling effect on the HTKS scores placed an upper limit on some children's performance and executive function growth and found that it did not affect our results. We therefore conclude that the current findings could not be attributed to children's reaching an upper limit of performance.

Overall, then, results showed that Direction and Suggestion language were distinct kinds of talk with differential associations with children's skills at the start of and throughout the school transition period. It seems that most parents react to their child's level of executive function when interacting with the child, and that directive language does not have a negative effect on preschool children's executive function growth, whereas suggestion language is associated with slower executive function development.

Limitations

It is important to acknowledge several challenges inherent to the study of management language. A major challenge in coding management language was determining whether certain parent questions and statements constitute directive or suggestive language. For example, many parents in this sample used questions such as "Can you set the table now?" or "Do you want to start cleaning up?" which may or may not be directive in nature and are open to interpretation. These utterances, termed Ambiguous Suggestions, are questions that are often spoken with an intonation indicative of a command. In these situations, whether or not the child has been granted a degree of choice or control is ambiguous, and seems to depend on the dynamics of the interaction between each parent and child. Indeed, the factor analysis revealed that this type of utterance loaded onto both the Direction and Suggestion factors. Likewise, Kochanska and colleagues (1987, 1989) identified a similar category of requests and labeled them "Indirect Commands". These types of utterances continue to pose a hindrance to achieving excellent inter-rater reliability and will remain a challenge in future studies of management language. However, it is now evident that unclear requests are a staple of parents' repertoire of management language, at least in middle- and upper-middle class homes.

Relatedly, a second limitation of this study is that the sample of families studied was notably advantaged in terms of maternal education, an important indicator of socioeconomic status. On average, mothers in this sample had the educational equivalent of a bachelor's degree. Thus, the sample did not permit an examination of socioeconomic differences in management language. Extant research suggests that parents of different SES levels may use different approaches to managing children's behavior (Baumrind & Black, 1967; Bradley, Corwyn, Pipes McAdoo, & García Coll, 2001). A more heterogeneous sample could provide the opportunity to identify differences in this aspect of parent behavior, and to connect them with child executive function outcomes. The absence of a relation between maternal education and children's baseline executive function score is likely due to the homogeneity of this sample on that dimension.

A further limitation of this study is the nature of the task during which parents' management language was assessed. The birthday party activity was generally familiar to and very enjoyable for children and parents; thus, it did not elicit much inappropriate behavior from children, nor did it require a lot of behavioral control on the part of the parent. Further, due to the sophistication of the props and materials involved, the task required organizational input from the parent, which is related to our outcome of executive function, but may serve more of a teaching function than actual behavior management. In order to extend the management language coding scheme to situations that involve a high degree of behavioral control, a different setting should be examined: one that does not have a set order of events and perhaps that is not as fun and engaging for children.

Future Research

The results of this study suggest several important directions for future research. One major direction includes further investigation of management language and its relations to executive function and other aspects of self-regulation. First, because the HTKS task is a

comprehensive measure of EF skills, more specific tasks should be used to examine how management language relates to each component of EF. Second, the HTKS requires skill in following directions, which means that children's exposure to management language (particularly Direction language) may affect their performance on the task. Other measures of EF should be used to see how management language relates to performance on tasks that involve fewer verbal directions. Indeed, management language may have unique relations with a host of self-regulation and learning-related social skills needed for succeeding in school. For example, the findings of Hindman and Morrison (2012) suggest a relation between parent management behaviors and other learning-related social skills such as cooperation, so the possibility of a relation between management language and the development of other social skills is worth investigating.

A second aim of future research will be to increase the external validity of these findings by observing parent-child interactions in unstructured, everyday tasks. This direct, observational measure of parents' control has important advantages over parent survey techniques and short, qualitative observations. However, the structured play task used in this study may not have provided a realistic setting in which parents would display the full range of their management behaviors. Future studies of management language will use naturalistic observation during everyday tasks in the home environment to examine how this aspect of parenting is related to executive function and other aspects of social and cognitive development.

A third direction for future research will be to seek an understanding of how management language functions in families of different cultural backgrounds. It is clear that past parenting research has focused too narrowly on White, middle-class families, and that the effects of parents' control behaviors can vary depending on the cultural and neighborhood context (Dearing, 2004). The families observed in the current study were quite diverse in terms of their ethnic and cultural backgrounds, but the relatively small sample size did not permit us to investigate whether management language functions similarly within all cultures. Examining the effects of management language in diverse groups of families will permit an examination of this variability, and will portray the effects of parenting practices on children's development more accurately. Additionally, investigating the use of management language in families from diverse backgrounds may provide insight into parents' use of Ambiguous Suggestion utterances described above.

Finally, further studies should investigate whether the effects of management language depend on child characteristics. As many researchers have pointed out, parents do not exert a unidirectional effect on children's development, and further, the effects of certain parenting behaviors may depend on children's temperament and skill levels (Bornstein, 2006; Sameroff, 2009). In particular, the effortful control dimension of temperament seems to play an important role in both the dynamics of everyday parent-child interactions and development of children's executive function (Kochanska, Aksan, & Joy, 2007; Kochanska et al., 2001; Kochanska & Knaack, 2003; Landry & Smith, 2010; Putnam, Sanson, & Rothbart, 2002). As the component of temperament that develops to support impulse control and other aspects of internal control of thoughts, emotions, and behavior, effortful control provides a different lens through which to view the effects of parenting on executive function. This theoretical framework encourages a more bidirectional view of parent-child interactions in which the parent reacts to the child's temperament and behaviors and vice versa. The next steps in this program of research should involve trying to determine which types of management language are most beneficial depending on the child's temperamental characteristics and initial level of social skills. This aim could be achieved by observing the parents' use of management language at various points in children's development. In particular, it would be informative to examine the growth of skills in children who have low

and high social skill levels during preschool to see whether particular types or styles of management are beneficial to certain children.

Conclusions

As an in-depth exploration of parental management utterances, this study provides a unique examination of parent management language that builds upon past work on this construct. The current study adds to past findings by demonstrating that this aspect of parenting has important connections with children's executive function development and may relate to other school-readiness skills. Parents' management language represents a useful window into the specific practices that make up parenting styles and relate directly to children's development of self-control and executive function-related skills.

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References

- Andrich D. A rating formulation for ordered response categories. *Psychometrika*. 1978; 43(4):561–573.
- Baldwin, A. Behavior and development in childhood. The Dryden Press; New York, NY: 1955.
- Baumrind D, Black AE. Socialization practices associated with dimensions of competence in preschool boys and girls. *Child Development*. 1967; 38(2):291–327. doi: 10.2307/1127295. [PubMed: 6057386]
- Belsky J, Pasco Fearon R, Bell B. Parenting, attention and externalizing problems: Testing mediation longitudinally, repeatedly and reciprocally. *Journal of Child Psychology and Psychiatry*. 2007; 48(12):1233–1242. doi: 10.1111/j.1469-7610.2007.01807.x. [PubMed: 18093029]
- Bernier A, Carlson SM, Whipple N. From external regulation to self-regulation: Early parenting precursors of young children's executive functioning. *Child Development*. 2010; 81(1):326–339. doi: 10.1111/j.1467-8624.2009.01397.x. [PubMed: 20331670]
- Blair C. How similar are fluid cognition and general intelligence? A developmental neuroscience perspective on fluid cognition as an aspect of human cognitive ability. *Behavioral and Brain Sciences*. 2006; 29(2):109–160. dpo: 10.1017/X0130525X06009034. [PubMed: 16606477]
- Blair C, Razza R. Relating effortful control, executive function, and false belief understanding to emerging math and literacy ability in kindergarten. *Child Development*. 2007; 78(2):647–663. doi: 10.1111/j.1467-8624.2007.01019.x. [PubMed: 17381795]
- Blair, C.; Ursache, A. A bidirectional model of executive functions and self-regulation. In: Vohs, KD.; Baumeister, RF., editors. *Handbook of self-regulation: Research, theory, and applications*. 2nd ed.. Guilford; New York, NY: 2011. p. 300-320.
- Bornstein, MH. Parenting science and practice. In: Damon, W.; Lerner, RM., editors. *Handbook of child psychology*. Vol. 4. Wiley; Hoboken, NJ: 2006. p. 893-949.
- Bradley RH, Corwyn RF, Pipes McAdoo H, García Coll C. The home environments of children in the United States Part I: Variations by age, ethnicity, and poverty status. *Child Development*. 2001; 72(6):1844–1867. doi: 10.1111/1467-8624.t01-1-00382. [PubMed: 11768149]
- Bronson, MB. *Self-regulation in early childhood: Nature and nurture*. Guilford Press; New York, NY: 2000.
- Curran PJ, Obeidat K, Losardo D. Twelve frequently asked questions about growth curve modeling. *Journal of Cognition and Development*. 2009; 11:121–136. doi: 10.1080/15248371003699969. [PubMed: 21743795]

- Davidson M, Amso D, Cruess Anderson L, Diamond A. Development of cognitive control and executive functions from 4 to 13 years: Evidence from manipulations of memory, inhibition, and task switching. *Neuropsychologia*. 2006; 44:2037–2078. [PubMed: 16580701]
- Dearing E. The developmental implications of restrictive and supportive parenting across neighborhoods and ethnicities: Exceptions are the rule. *Applied Developmental Psychology*. 2004; 25:555–575. doi: 10.1016/j.appdev.2004.08.007.
- Diaz, RM.; Neal, CJ.; Amaya-Williams, M. The social origins of self-regulation. In: Moll, LC., editor. *Vygotsky and education: Instructional implications and applications of sociohistorical psychology*. Cambridge University Press; New York, NY: 1992. p. 127-154.
- Duncan G, Dowsett C, Claessens A, Magnuson K, Huston A, Klebanov P, Japel C. School readiness and later achievement. *Developmental Psychology*. 2007; 43(6):1428–1446. doi: 10.1037/0012-1649.43.6.1428. [PubMed: 18020822]
- Eisenberg N, Vidmar M, Spinrad TL, Eggum ND, Edwards A, Gaertner B, Kupfer A. Mothers' teaching strategies and children's effortful control: A longitudinal study. *Developmental Psychology*. 2010; 46(5):1294–1308. doi: 10.1037/a0020236. [PubMed: 20822239]
- Estrada P, Arsenio WF, Hess RD, Holloway SD. Affective quality of the mother-child relationship: Longitudinal consequences for children's school-relevant cognitive functioning. *Developmental Psychology*. 1987; 23(2):210–215. doi: 10.1037/0012-1649.23.2.210.
- Gathercole SE, Pickering SJ. Working memory deficits in children with low achievements in the national curriculum at 7 years of age. *British Journal of Educational Psychology*. 2000; 70(2):177–194. doi: 10.1348/000709900158047. [PubMed: 10900777]
- Grolnick WS, Gurland ST, DeCoursey W, Jacob K. Antecedents and consequences of mothers' autonomy support: An experimental investigation. *Developmental Psychology*. 2002; 38(1):143–155. doi: 10.1037/0012-1649.38.1.143. [PubMed: 11806696]
- Grolnick WS, Pomerantz EM. Issues and challenges in studying parental control: Toward a new conceptualization. *Child Development Perspectives*. 2009; 3(3):165–170. doi: 10.1111/j.1750-8606.2009.00099.x.
- Hindman AH, Morrison FJ. Differential contributions of three parenting dimensions to preschool literacy and social skills in a middle-income sample. *Merrill-Palmer Quarterly*. 2012; 58:191–223. doi: 10.1353/mpq.2012.0012.
- Hoff, E.; Laursen, B.; Tardif, T. Socioeconomic status and parenting. In: Bornstein, MH., editor. *Handbook of parenting: Vol. 2: Biology and ecology of parenting*. 2nd ed.. Erlbaum; Mahwah, NJ: 2002. p. 231-252.
- Kaiser H. The application of electronic computers to factor analysis. *Education and Psychological Measurement*. 1960; 20:141–151.
- Karremans A, van Tuijl C, van Aken MAG, Dekovic M. Parenting, coparenting, and effortful control in preschoolers. *Journal of Family Psychology*. 2008; 22(1):30–40. doi: 10.1037/0893-3200.22.1.30. [PubMed: 18266530]
- Kochanska G. Children's interpersonal influence with mothers and peers. *Developmental Psychology*. 1992; 28(3):491–499.
- Kochanska G, Aksan N. Children's conscience and self-regulation. *Journal of Personality*. 2006; 74(6):1587–1617. doi: 10.1111/j.1467-6494.2006.00421.x. [PubMed: 17083659]
- Kochanska G, Aksan N, Joy M. Children's fearfulness as a moderator of parenting in early socialization: Two longitudinal studies. *Developmental Psychology*. 2007; 43(1):222–237. [PubMed: 17201521]
- Kochanska G, Coy KC, Murray KT. The development of self-regulation in the first four years of life. *Child Development*. 2001; 72(4):1091–1111. doi: 10.1111/1467-8624.00336. [PubMed: 11480936]
- Kochanska G, Knaack A. Effortful control as a personality characteristic of young children: Antecedents, correlates, and consequences. *Journal of Personality*. 2003; 71(6):1087–1112. [PubMed: 14633059]
- Kochanska G, Kuczynski L, Maguire M. Impact of diagnosed depression and self-reported mood on mothers' control strategies: A longitudinal study. *Journal of abnormal child psychology*. 1989; 17(5):493–511. [PubMed: 2808943]

- Kochanska G, Philibert RA, Barry RA. Interplay of genes and early mother-child relationship in the development of self-regulation from toddler to preschool age. *Journal of Child Psychology and Psychiatry*. 2009; 50(11):1331–1338. doi: 10.1111/j.1469-7610.2008.02050.x. [PubMed: 19207629]
- Kopp CB. Antecedents of self-regulation: A developmental perspective. *Developmental Psychology*. 1982; 18(2):199–214. doi: 10.1037/0012-1649.18.2.199.
- Kuczynski L, Kochanska G. Development of children's noncompliance strategies from toddlerhood to age 5. *Developmental Psychology*. 1990; 26(3):398–408. doi: 10.1037/0012-1649.26.3.398.
- Kuczynski L, Kochanska G, Radke-Yarrow M, Girnius-Brown O. A developmental interpretation of young children's noncompliance. *Developmental Psychology*. 1987; 23(6):799–806. doi: 10.1037/0012-1649.23.6.799.
- Landry, SH.; Smith, KE. Early social and cognitive precursors and parental support for self-regulation and executive function: Relations from early childhood into adolescence. In: Sokol, BW.; Müller, U.; Carpendale, JIM.; Young, AR.; Iarocci, G., editors. *Self and social regulation: Social interaction and the development of social understanding and executive functions*. Oxford University Press; New York, NY: 2010. p. 386-417.
- Landry SH, Smith KE, Swank PR, Miller-Loncar CL. Early maternal and child influences on children's later independent cognitive and social functioning. *Child Development*. 2000; 71(2): 358–375. doi: 10.1111/1467-8624.00150. [PubMed: 10834470]
- Leaper C, Anderson KJ, Sanders P. Moderators of gender effects on parents' talk to their children: A meta-analysis. *Developmental Psychology*. 1998; 34(1):3–27. doi: 10.1037/0012-1649.34.1.3. [PubMed: 9471001]
- Linacre, J. Facets Computer Program for Many-Facet Rasch Measurement (Version 3.67). 2010. [Computer software]. Retrieved from <http://www.winsteps.com/facets.htm>
- Linacre J, Wright B. Chi-Square fit statistics. *Rasch Measurement Transactions*. 1994; 8(2):360.
- Luria, AR. The role of speech in the regulation of normal and abnormal behavior. Pergamon; Oxford, England: 1961.
- Matte-Gagné C, Bernier A. Prospective relations between maternal autonomy support and child executive functioning: Investigating the mediating role of child language ability. *Journal of Experimental Child Psychology*. 2011; 110(4):611–625. doi: 10.1016/j.jecp.2011.06.006. [PubMed: 21798554]
- McCabe, LA.; Rebello-Britto, P.; Hernandez, M.; Brooks-Gunn, J. Games children play: Observing young children's self-regulation across laboratory, home, and school settings. In: DelCarmen-Wiggins, R.; Carter, A., editors. *Handbook of infant, toddler, and preschool mental health assessment*. Oxford University Press; New York, NY: 2004. p. 491-521.
- McClelland MM, Acock AC, Morrison FJ. The impact of kindergarten learning-related skills on academic trajectories at the end of elementary school. *Early Childhood Research Quarterly*. 2006; 21(4):471–490. doi: 10.1016/j.ecresq.2006.09.003.
- McClelland MM, Acock AC, Piccinin A, Rhea SA, Stallings MC. Relations between preschool attention span-persistence and age 25 educational outcomes. *Early Childhood Research Quarterly*. 2012 Advance online publication. doi: 10.1016/j.ecresq.2012.07.008.
- McClelland MM, Cameron CE, Connor CM, Farris CL, Jewkes AM, Morrison FJ. Links between behavioral regulation and preschoolers' literacy, vocabulary, and math skills. *Developmental Psychology*. 2007; 43(4):947–959. doi: 10.1037/0012-1649.43.4.947. [PubMed: 17605527]
- McClelland MM, Morrison FJ, Holmes DL. Children at risk for early academic problems: The role of learning-related social skills. *Early Childhood Research Quarterly*. 2000; 15(3):307–329. doi: 10.1016/s0885-2006(00)00069-7.
- Müller, U.; Lieberman, D.; Frye, D.; Zelazo, PD. Executive function, school readiness, and school achievement. In: Thurman, SK.; Fiorello, CA., editors. *Applied cognitive research in K-3 classrooms*. Routledge/Taylor & Francis Group; New York, NY: 2008. p. 41-83.
- Muthén, L.; Muthén, B. Mplus user's guide. 4th ed.. Muthén & Muthén; Los Angeles, CA: 2007.
- National Institute of Child Health and Human Development Early Child Care Research Network. Do children's attention processes mediate the link between family predictors and school readiness? *Developmental Psychology*. 2003; 39(3):581–593. [PubMed: 12760525]

- National Institute of Child Health and Human Development Early Child Care Research Network. Multiple pathways to early academic achievement. *Harvard Educational Review*. 2004; 74(1):1–28.
- National Institute of Child Health and Human Development Early Child Care Research Network. Predicting individual differences in attention, memory, and planning in first graders from experiences at home, child care, and school. *Developmental Psychology*. 2005; 41(1):99–114. doi: 10.1037/0012-1649.41.1.99. [PubMed: 15656741]
- Pianta RC, Nimetz SL, Bennett E. Mother-child relationships, teacher-child relationships, and school outcomes in preschool and kindergarten. *Early Childhood Research Quarterly*. 1997; 12(3):263–280. doi: 10.1016/s0885-2006(97)90003-x.
- Pianta RC, Smith N, Reeve RE. Observing mother and child behavior in a problem-solving situation at school entry: Relations with classroom adjustment. *School Psychology Quarterly*. 1991; 6(1):1–15. doi: 10.1037/h0088238.
- Ponitz CC, McClelland MM, Jewkes AM, Connor CM, Farris CL, Morrison FJ. Touch your toes! Developing a direct measure of behavioral regulation in early childhood. *Early Childhood Research Quarterly*. 2008; 23(2):141–158. doi: 10.1016/j.ecresq.2007.01.004.
- Ponitz CC, McClelland MM, Matthews JS, Morrison FJ. A structured observation of behavioral self-regulation and its contribution to kindergarten outcomes. *Developmental Psychology*. 2009; 45(3):605–619. doi: 10.1037/a0015365. [PubMed: 19413419]
- Posner M, Rothbart M. Developing mechanisms of self-regulation. *Development and Psychopathology*. 2000; 12(3):427–441. [PubMed: 11014746]
- Putnam, SP.; Sanson, AV.; Rothbart, MK. Child temperament and parenting. In: Bornstein, MH., editor. *Handbook of parenting*. Vol. 1. Erlbaum; Mahwah, NJ: 2002. p. 255-277.
- Rasch, G. Probabilistic models for some intelligence and attainment tests. University of Chicago Press; Chicago, IL: 1980. Expanded edition
- Raudenbush, SW.; Bryk, AS. Hierarchical linear models: Applications and data analysis methods. 2nd ed.. Sage; Thousand Oaks, CA: 2002.
- Rennie DAC, Bull R, Diamond A. Executive functioning in preschoolers: Reducing the inhibitory demands of the dimensional change card sort task. *Developmental Neuropsychology*. 2004; 26(1):423–443. doi: 10.1207/s15326942dn2601. [PubMed: 15276903]
- Sameroff, A. The transactional model of development: How children and contexts shape each other. American Psychological Association; Washington, DC: 2009.
- Shrout P, Fleiss J. Intraclass correlations: Uses in assessing rater reliability. *Psychological Bulletin*. 1979; 86(2):420–428. [PubMed: 18839484]
- Vazsonyi AT, Huang L. Where self-control comes from: On the development of self-control and its relationship to deviance over time. *Developmental Psychology*. 2010; 46(1):245–257. doi: 10.1037/a0016538. [PubMed: 20053021]
- Vygotsky, LS. *Mind in society: The development of higher psychological processes*. Harvard University Press; Cambridge, MA: 1978.
- Winsler, A. Still talking to ourselves after all these years: A review of current research on private speech. In: Winsler, A.; Fernyhough, C.; Montero, I., editors. *Private speech, executive functioning, and the development of verbal self-regulation*. Cambridge University Press; New York: 2009. p. 3-41.
- Winsler A. Parent-child interaction and private speech in boys with ADHD. *Applied Developmental Science*. 1998; 2(1):17–39. doi: 10.1207/s1532480xads0201_2.
- Winsler A, Diaz RM, McCarthy EM, Atencio DJ, Chabay LA. Mother-child interaction, private speech, and task performance in preschool children with behavior problems. *Journal of Child Psychology and Psychiatry*. 1999; 40(6):891–904. doi: 10.1111/1469-7610.00507. [PubMed: 10509884]
- Winsler A, Diaz RM, Montero I. The role of private speech in the transition from collaborative to independent task performance in young children. *Early Childhood Research Quarterly*. 1997; 12(1):59–79. doi: 10.1016/s0885-2006(97)90043-0.
- Wood D, Bruner JS, Ross G. The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry*. 1976; 17(2):89–100. doi: 10.1111/j.1469-7610.1976.tb00381.x. [PubMed: 932126]

Wright BD. Estimating Rasch measures for extreme scores. *Rasch Measurement Transactions*. 1998; 12:632–633.

Highlights

- We explored how parents' management language predicts children's executive function
- Management language was observed during a pretend birthday party play task
- Suggestion language predicted higher age three executive function but slower growth
- Direction language predicted lower age three executive function
- Management language contributes to preschoolers' executive function development

Figure 1.

Latent growth curve model of executive function with management language predictors. Coefficients reported are standardized regression coefficients, * $p < .05$.

Table 1
Descriptive Statistics for Management Language and Rescaled Executive Function Variables

	<i>N</i>	Total Mean(<i>SD</i>)	Min.	Max.	Boys Mean(<i>SD</i>)	Girls Mean(<i>SD</i>)
Explicit Direction	127	34.91(15.45)	10.99	101.02	19.86(13.87)	21.75(18.25)
Qualified Direction	127	2.97(2.60)	0.55	16.66	1.49(2.16)	1.70(3.05)
Ambiguous Suggestion	127	16.36(10.00)	3.60	62.52	12.38(9.36)	14.05(10.72)
Single Suggestion	127	1.45(1.46)	0.23	9.72	0.89(1.50)	0.89(1.45)
Choice	127	0.61(0.97)	0.03	5.09	0.52(0.98)	0.55(0.98)
Transfer	127	7.88(5.50)	1.17	38.14	5.10(5.55)	4.83(5.66)
EF Ages 2.9 – 3.5	44	−3.01(1.40)	−4.43	1.75	−3.33(0.96)	−2.62(1.73)
EF Ages 3.5 – 4.1	113	−1.42(2.30)	−3.79	2.80	−1.07(2.49)	−1.76(2.07)
EF Ages 4.1 – 4.7	140	−0.33(2.11)	−3.79	2.80	−0.31(2.09)	−0.35(2.15)
EF Ages 4.7 – 5.3	129	0.72 (1.45)	−3.79	4.01	0.78(1.48)	0.67(1.43)
EF Ages 5.3 – 5.9	126	1.13(1.23)	−3.79	4.01	1.25(1.02)	1.02(1.41)
EF Ages 5.9 – 6.65	62	1.49(0.90)	−0.96	2.92	1.89(0.71)	1.19(0.92)

Table 2
Pair-wise correlations between maternal education, child age at home visit, and each type of management language

	1	2	3	4	5	6	7	8
1. Maternal Education	---							
2. Child age at home visit	.055	---						
3. Explicit Direction	-.045	-.299 *	---					
4. Qualified Direction	-.068	-.178 *	.422 *	---				
5. Ambiguous Suggestion	.054	-.107	.316 *	.297 *	---			
6. Suggestion	.017	-.132	.042	.013	.121	---		
7. Choice	-.089	-.026	.066	.041	.233 *	.208 *	---	
8. Transfer	.029	-.179 *	.196 *	.039	.541 *	.166	.358 *	---

Note.

*
 $p < .05$

Table 3
Linear regression analyses predicting Direction and Suggestion

Outcome	Predictor	<i>B</i>	<i>SE</i>	<i>b</i>	<i>t</i>	<i>sig.</i>
Direction	Intercept	75.38	19.81		3.81	*
	Maternal Education	−0.32	0.88	−0.03	−0.36	
	Child Age at Home Visit	−10.52	3.24	−0.30	−3.25	*
	Child Gender	−3.08	3.23	−0.09	−0.95	
Suggestion	Intercept	30.27	16.04		1.89	
	Maternal Education	0.40	0.72	0.05	0.55	
	Child Age at Home Visit	−3.95	2.62	−0.15	−1.51	
	Child Gender	0.38	2.61	0.01	0.15	

Note.

*
 $p < .05$

Table 4
Correlations between Maternal Education, Management Language, and Rasch Scaled Executive Function Data

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Maternal Education	---												
2. Explicit Direction	-.045	---											
3. Qualified Direction	-.068	.422 [*]	---										
4. Ambiguous Suggestion	.054	.316 [*]	.297 [*]	---									
5. Suggestion	.017	.042	.013	.121	---								
6. Choice	-.089	.066	.041	.233 [*]	.208 [*]	---							
7. Transfer	.029	.196 [*]	.039	.541 [*]	.166	.358 [*]	---						
8. EF Ages 2.9 – 3.5	-.033	-.035	-.095	.174	.263 [*]	.084	.176	---					
9. EF Ages 3.5 – 4.1	.090	-.167	-.287 [*]	-.016	.021	.089	.018	.378 [*]	---				
10. EF Ages 4.1 – 4.7	.048	-.265 [*]	-.108	.027	-.074	.036	-.044	.173	.477 [*]	---			
11. EF Ages 4.7 – 5.3	.115	-.234 [*]	-.072	.056	-.221 [*]	-.060	.032	.094	.370 [*]	.359 [*]	---		
12. EF Ages 5.3 – 5.9	.281 [*]	-.186	-.098	-.155	-.090	-.014	-.197 [*]	-.100	.286 [*]	.376 [*]	.260 [*]	---	
13. EF Ages 5.9 – 6.65	.015	-.293 [*]	.016	-.150	-.006	-.063	-.161	.252 [*]	.328 [*]	.176	.379 [*]	.283 [*]	---

Note.

^{*} $p < .05$