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Parenting Predictors of Delay Inhibition in Socioeconomically Disadvantaged Preschoolers

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Abstract

This study examined longitudinal associations between specific parenting factors and delay inhibition in socioeconomically disadvantaged preschoolers. At Time 1, parents and 2- to 4-year-old children (mean age = 3.21 years; $N = 247$) participated in a videotaped parent-child free play session, and children completed delay inhibition tasks (gift delay-wrap, gift delay-bow, and snack delay tasks). Three months later, at Time 2, children completed the same set of tasks. Parental responsiveness was coded from the parent-child free play sessions, and parental directive language was coded from transcripts of a subset of 127 of these sessions. Structural equation modeling was used, and covariates included age, gender, language skills, parental education, and Time 1 delay inhibition. Results indicated that in separate models, Time 1 parental directive language was significantly negatively associated with Time 2 delay inhibition, and Time 1 parental responsiveness was significantly positively associated with Time 2 delay inhibition. When these parenting factors were entered simultaneously, Time 1 parental directive language significantly predicted Time 2 delay inhibition whereas Time 1 parental responsiveness was no longer significant. Findings suggest that parental language that modulates the amount of autonomy allotted the child may be an important predictor of early delay inhibition skills.

Keywords

parenting; delay inhibition; executive function; early childhood

Parenting Predictors of Delay Inhibition in Socioeconomically Disadvantaged Preschoolers

Executive function (EF) refers to a set of cognitive processes that are linked with the prefrontal cortex and facilitate flexible, goal-directed behavior (Hughes, 2011). These and similar sets of self-regulatory skills have been referred to in previous research using a range of terms, including effortful control, executive attention, and cognitive control (Zhou, Chen, & Main, 2010). Delay inhibition is an EF process that is defined as the ability to inhibit automatic responses or control impulses in the context of tempting rewards (Carlson, Moses, & Breton, 2002; Carlson, White, & Davis-Unger, 2014; Conway & Stifter, 2012). Delay inhibition skills, measured using delay of gratification tasks, emerge early in life and develop rapidly during early childhood (Bell & Wolfe, 2007; Bunge & Wright, 2007; Garon, Bryson, & Smith, 2008; Rueda, Rothbart, McCandliss, Saccomanno, & Posner, 2005). Individual differences in early delay inhibition predict children's later school readiness, academic achievement (Duncan et al., 2007; Mischel, Shoda, & Rodriguez, 1989; Razza & Raymond, 2013), and social-emotional competence (Zelazo & Muller, 2002), while early delay inhibition difficulties predict later internalizing and externalizing problems (Campbell & von Stauffenberg, 2009; Kim et al., 2013).

Interest in the contextual factors associated with early delay inhibition is driven in part by findings indicating that early childhood constitutes a period of considerable plasticity in the prefrontal circuits underlying delay inhibition (Mackey, Raizada, & Bunge, 2012). At a distal level, higher socioeconomic status (SES), as indexed by parental education and family income, is associated with greater delay inhibition in preschool-age children (Ardila, Rosselli, Matute, & Guajardo, 2005; Lengua et al., 2014; Razza & Raymond, 2013). At a more proximal level, parenting quality has been found to contribute to individual differences in early delay inhibition (Fay-Stammach, Hawes, & Meredith, 2014; Matte-Gagne & Bernier, 2011). It is thought that by initially providing external support for self-regulation, parents may facilitate children's gradual internalization of increasing self-regulatory skills (Kochanska, Murray, & Harlan, 2000; Kopp, 1982). Yet, the specific parenting factors that relate to individual differences in delay inhibition are not well-understood. Parental responsiveness, which refers to sensitive and contingent responding to children's signals, is thought to support delay inhibition by regulating stress-response systems and providing opportunities to take the lead and make choices during joint activities (Landry, Smith, & Swank, 2006). Conversely, frequent parental verbal directives or commands to the child may interfere with delay inhibition development by undermining children's autonomy (Grolnick & Ryan, 1989).

The purpose of the current study was to examine the longitudinal associations of parental responsiveness and directive language with delay inhibition in socioeconomically disadvantaged preschoolers. Understanding these associations in children from low SES

families may inform the design of interventions that reduce socioeconomic disparities in early development and school readiness.

Parental Responsiveness and Delay Inhibition

As described across theoretical frameworks, including attachment theory, parental responsiveness behaviors (also termed *sensitivity*) include warm acceptance of the child's needs and interests and sensitive and contingent responses to child signals (Landry, Smith, & Swank, 2006). This parenting factor is theorized to facilitate children's emotion and stress regulation, which in turn encourages exploration of the environment and engagement in problem-solving activities (Bowlby, 1982; Bernier, Carlson, Deschenes, & Matte-Gagne, 2012). During infancy, parental responsiveness may also increase self-efficacy by demonstrating to the infant that his/her actions produce changes in the environment (Gecas, 1989). At older ages, parental responsiveness is also thought to ensure that the child gets to take the lead and make choices during parent-child interactions. Neurobiological research has indicated that parental responsiveness and parent-child attachment quality are linked with stress-response system regulation (Gunnar & Quevedo, 2007) and prefrontal cortex development (Mackey, Raizada, & Bunge, 2012). Thus, it is particularly important to examine whether these associations are observed at the behavioral level.

Some previous findings have provided empirical support for the notion that parental responsiveness may promote children's delay inhibition. For instance, in a middle- to upper-SES sample, observed parental sensitivity across the first three years was found to predict delay of gratification at 54 months (Razza & Raymond, 2013). In addition, parental responsiveness has been found to predict similar self-regulatory skills, including effortful control (Karreman, van Tuijl, van Aken, & Dekovic, 2008; Kochanska, Murray, & Harlan, 2000; Lengua, Honorado, & Bush, 2007; Spinrad et al., 2007), inhibitory control (Olson, Bates, & Bayles, 1990), and sustained attention (NICHD Early Child Care Research Network, 2003). In a study of middle- to upper-SES children, observed parental sensitivity to infants at ages 12-13 months significantly predicted conflict EF (i.e., a working memory and inhibitory control composite) but not delay of gratification at 26 months (Bernier, Carlson, & Whipple, 2010). Differences in the measurement of responsiveness across studies should be noted. Although most studies measured parental responsiveness using observational methods, various coding schemes were used; also, some studies measured parenting using self-report questionnaires. Thus, research is needed to better understand the role of parental responsiveness in delay inhibition development, especially in low SES preschoolers.

Parental Directive Language and Delay Inhibition

Parental directive language refers to verbal commands that parents use to guide and control their child's behavior. Parental directive language is one of the most controlling types of language used to manage children's behavior. Less controlling management language, which offers the child more choice in his/her behavior, includes suggestions and reasoning (Bindman et al., 2013).

Parents vary in the degree to which they use directive language (Landry, Smith, Swank, & Miller-Loncar, 2000). High levels of parental directive language are expected to disrupt delay inhibition development by interfering with the child's autonomy (Grolnick & Ryan, 1989; Grolnick, Gurland, DeCoursey, & Jacob, 2002). Indeed, parental autonomy support (i.e., ratings based on observations of how the parent helped the child complete challenging puzzles) has been identified as a robust predictor of children's EF skills (Bernier, Carlson, & Whipple, 2010). A construct similar to autonomy support, parental scaffolding, is defined as support for the child's autonomous problem-solving. In one study, parental scaffolding, which was coded as the amount of time the parent used appropriate scaffolding behaviors (e.g., stepping in and helping when needed, providing level of assistance matched to the child's needs) during a challenging puzzle task, was found to foster EF in early childhood (Hammond et al., 2012). In contrast, controlling or intrusive parental behavior has been associated with EF and self-regulatory difficulties (Egeland, Pianta, & O'Brien, 1993; Frodi, Bridges, & Grolnick, 1985; Karreman et al., 2008; Kochanska & Knaack, 2003; Silverman & Ragusa, 1990; Roskam, Stievenart, Meunier, & Noel, 2014).

Parental directive utterances predict negative cognitive developmental outcomes in children, whereas instructive utterances that offer children more choice predict positive outcomes in children (Fagot & Gauvain, 1997; Gauvain, Fagot, Leve, & Kavanagh, 2002; Hess & McDevitt, 1984; Masur, Flynn, & Eichorst, 2005; Pan, Imbens-Bailey, Winner, & Snow, 1996; Pine, 1994). In a study that focused on EF, parental directive language during a structured task was negatively associated with children's EF at age three but was not significantly related to the rate of EF development over time in the preschool and kindergarten years (Bindman, Hindman, Bowles, & Morrison, 2013). In addition, parental directives at 3 ½ years were negatively associated with children's goal-directed skills at 4 ½ years (Landry, Smith, Swank, & Miller-Loncar, 2000). Also, higher levels of maternal scaffolding talk (e.g., open-ended questions, praise, encouragement, or elaborations) during a structured activity predicted higher EF performance in children at age four (Hughes & Ensor, 2009).

Unique Contributions of Parental Responsiveness and Directive Language

Parental responsiveness and directives may have overlapping or similar mechanisms related to the degree of choice and control allotted to the child (Razza & Raymond, 2013). Parental responsiveness may facilitate child choices and opportunities to take the lead whereas directives may reduce child choices and prevent the child from leading the interaction. Indeed, parents who frequently use directives with their children are considered to be low in responsiveness (e.g., Gest, Freeman, Domitrovich, & Welsh, 2004). On the other hand, each parenting behavior also has distinctive features, and hence possibly distinct contributions to child delay inhibition. For example, responsiveness refers primarily to what the parent does, whereas directives refer specifically to what the parent says to the child.

Current Study

The goal of the current study was to examine the longitudinal associations of parental responsiveness and directive language with delay inhibition in socioeconomically disadvantaged preschoolers. At Time 1 (T1), parents and 2- to 4-year-old children ($N = 247$)

participated in parent-child free play sessions, and children completed three delay inhibition tasks. At Time 2 (T2), children completed the same three delay inhibition tasks. Parental responsiveness and directive language were coded from videotapes of the free play sessions.

We first examined parental responsiveness and directive language in separate models, and then we entered them simultaneously to investigate their unique contributions to delay inhibition. Analyses controlled for variables that have been found to correlate with delay inhibition, such as child age, gender, parental education, and child verbal ability (language skills). For instance, child verbal ability is positively associated with delay inhibition during early childhood (Carlson & Beck, 2009; Matte-Gagné & Bernier, 2011). In addition, girls have been found to outperform boys on delay inhibition tasks (Mileva-Seitz et al., 2015; Wiebe, Espy, & Charak, 2008). Analyses predicting T2 delay inhibition also controlled for T1 delay inhibition to reduce the possibility that continuity in children's delay inhibition may account for the association between higher quality parenting and higher child delay inhibition (Blair et al., 2014).

Based on theory and prior research, we expected parental responsiveness to be positively associated with delay inhibition and parental directives to be negatively associated with delay inhibition. We did not make any predictions about whether these parenting factors would account for unique variance in delay inhibition because they are distinct, yet related, processes and both are theorized to predict delay inhibition.

Findings from prior studies that have examined similar research questions in middle to high SES children (e.g., Razza & Raymond, 2013) may not generalize to low SES populations. Thus, elucidation of these associations in low SES children may lead to a greater understanding of the antecedents of delay inhibition in children at risk. This information can be used by those designing parenting interventions to improve children's delay inhibition.

Method

Participants

Sample characteristics—Participants in this study were 2 to 4 years of age at T1 (mean age at T1 = 3.21 years; 48% male) and 78% were African American (see Table 1). At T2, participants ranged in age from 2 to 4 years ($M = 3.49$; $SD = .57$). They were from families in Houston, Texas (53%) and Tallahassee, Florida (47%). None of the children had any significant visual/auditory impairments or cognitive/language deficits.

Recruitment—Childcare centers were recruited across three years (cohorts) for a large, two-site childcare center-based intervention project (Landry et al., 2014). Databases from the Texas Department of Family and Protective Services and Florida Department of Children and Families were used to recruit childcare centers in which 50% of children in the center used federal or state childcare subsidies to attend. One classroom per center was invited to participate, and informed consent was obtained from childcare teachers. After obtaining informed consent from parents, approximately 8 children were randomly selected from each classroom to participate in the study. Classrooms were randomly assigned to one of three conditions: responsive teaching intervention, responsive teaching plus explicit social-

emotional classroom activities intervention, or business-as-usual control. Results indicated that children in the interventions outperformed control children in areas of social and emotional development, although the groups did not differ in terms of cognitive skills (language, literacy, and math; Landry et al., 2014). Given that the current study was not focused on intervention effects, intervention status was examined for inclusion as a covariate in main analyses.

Parent participation rate—Of the 429 total child participants in this child care center-based intervention study at T1, approximately 307 parents (72% of the child sample) completed the parent portion of the study, which included questionnaires, an interview, and a parent-child free play session. Multilevel logistic regression indicated that the likelihood of parent participation in the study was *not* significantly associated with child age, gender, race/ethnicity, language skills, delay inhibition, intervention status, site, or cohort, $F(1-2, 311-510)=.10-2.22$, *ns*.

Attrition—Of the 307 child participants with T1 parent-report and parenting data, approximately 247 (80%) had T2 data. Selective attrition analyses indicated that child age, gender, race/ethnicity, parental education, parent marital status, number of parents in the household, T1 language skills, T1 delay inhibition, site, cohort, and intervention status did not significantly predict the likelihood of having T2 data, $F(1-2, 275-306)=.14-1.59$, *ns*.

Procedure

In the middle of the academic year (usually in January; T1), parents completed the parent questionnaire and a videotaped parent-child free play session at the child care center and children participated in videotaped delay inhibition tasks (gift delay-wrap, gift delay-bow, and snack delay tasks) and a language assessment at their child care centers. During the free play session, parents and children were presented with a standard set of toys (Fisher Price Little People castle play set with figurines, a Play-Doh Fun Factory molding toy, two 5-ounce cans of Play-Doh, and a set of wooden blocks) and asked to play as they normally would for 10 minutes. Most of the parents who participated were the mothers of the children (91%), but some were fathers (7%), grandmothers (1%), and grandfathers (1%). Supplemental analyses showed no effects or differences as a function of who played with the child; in this study, all will be referred to as parents. Approximately three months later, toward the end of the academic year (April-May; T2), children again completed the same three delay inhibition tasks.

Videotapes of the parent-child free play sessions and the delay inhibition tasks were coded in the lab (284 out of 307 free play videos were available for coding due primarily to video recording or transfer errors). Different research staff coded parental responsiveness, parental directive language, and delay inhibition to prevent bias from knowledge of one set of codes. To assess interrater reliability, a second individual coded approximately 25-35% of the parent-child free play and delay inhibition videos, and intraclass correlations (ICCs) were calculated.

Measures

Parental responsiveness—Parents were rated for warm acceptance and responsiveness/flexibility on 5-point scales (higher values indicate greater warm acceptance or responsiveness/flexibility) for the 10 minutes of play. The rating scales were adapted from scales developed by the second author and used extensively in previous research (e.g., Landry, Smith, & Swank, 2006). Ratings of warm acceptance were based on the following indicators: positive affect (smiles, positive tone of voice), praise, encouragement, physical affection, acceptance of child's needs and interests, and lack of negativity toward the child. Ratings of responsiveness/flexibility were based on the following indicators: consistent involvement, prompt and appropriate responses to the child's signals, following the child's lead, expanding on the child's play interests, and absence of controlling behavior. Four coders spent three weeks in training with a master coder to achieve reliability, and coding was completed over a 6-week period during which all coders were supervised to monitor drift and reliability. Inter-rater reliabilities (ICCs) were .73 and .74 for warm acceptance and responsiveness/flexibility, respectively. Parental warm acceptance and responsiveness/flexibility were highly correlated ($r=.74$) and therefore were standardized and averaged to create a composite measure of parental responsiveness.

Parental directive language—Parental speech to the child was transcribed from the videotaped free play sessions. The unit of transcription was the utterance, defined as a sequence of words that usually represents a complete thought and is marked by a pause, change in intonation (rising or falling), or change in conversational turn. Transcription was conducted by trained research assistants at one research site, and all transcripts were verified by a research assistant at another research site. Any disagreements were marked and resolved by this second individual, resulting in 93% agreement.

Due to funding constraints, only 45% (127 out of 284) of the parent-child free play videos were transcribed and only from cohorts one and two (out of three cohorts). Multilevel logistic regression indicated that there were no significant differences between participants whose free play sessions were transcribed and participants whose free play sessions were not transcribed in child age, gender, race/ethnicity, language skills, delay inhibition, parental education, site, or intervention status, $F(1-2, 263-272)=.02-1.02, ns$.

We were interested in examining parental use of directives in their play-related talk. Therefore, we used two codes to eliminate non-play-related utterances that were: (a) inaudible, vague filler (e.g., *Umm; Oh*) or simple affirmations/negations (*Yes; Ok; No*), and (b) strictly related to managing/praising the child's behavior (e.g., *You want to sit closer?; Good job*) or disciplining the child (e.g., *Talk quietly; Say thank you*). All remaining play-related utterances were coded as to whether they were directives. In our coding system, directives were defined narrowly as imperative sentences that demanded an action (e.g., *Get some more play dough; Put the horse there*) because we were interested in examining the effects of the most controlling type of management language on children's delay inhibition. Other types of less controlling language, such as directives posed as questions or voiced with the intonation of a question, were not coded as directives. Agreement between coders for distinguishing directives from other utterance types was 95%.

A frequency score was created by summing the number of directives, and a proportion score was created by dividing the number of directives by the total number of play-related utterances. As in prior research on parent talk (e.g., Brownell, Svetlova, Anderson, Nichols, & Drummond, 2013), proportion scores were used in analyses to control for different amounts of play-related utterances.

Delay inhibition—At Times 1 and 2, children completed the gift delay-wrap, gift delay-bow, and snack delay tasks. In the gift delay-wrap task (Kochanska et al., 2000; Li-Grining, 2007), children were told that they would be receiving a present but that they could not peek while the present was being wrapped. Children were then instructed to turn their backs to the experimenter as the experimenter noisily wrapped the present for 60 seconds. Scores for strategy (1 = child turns around and does not turn back; 2 = child turns around and turns back; 3 = child looks over shoulder enough to see; 4 = child turns head to side but not over 90 degrees; 5 = child does not try to peek) and latency to peek (in seconds) were strongly correlated (T1: $r = .82$, $p < .001$; T2: $r = .82$, $p < .001$) and thus were standardized and averaged (interrater reliability: T1 ICC = .96; T2 ICC = .90).

In the gift delay-bow task (Kochanska et al., 2000), the wrapped gift was placed on the table in front of the child and the child was told to wait in his/her chair and not to touch or open the gift until the experimenter returned with a bow. The delay lasted two minutes. Scores for strategy (1 = child takes the gift out of the box; 2 = child opens the box; 3 = child touches the box but does not open it; 4 = child never touches the box) and latency to touch (in seconds) were strongly correlated (T1: $r = .88$, $p < .001$; T2: $r = .89$, $p < .001$) and thus were standardized and averaged (interrater reliability: T1 ICC = .94; T2 ICC = .98).

In the snack delay task (Kochanska et al., 2000; Spinrad et al., 2007), children were asked to place their hands flat on a table and to withhold from eating or touching a piece of candy placed in front of them (under a clear, plastic cup) until the experimenter rang a bell. In the middle of each trial, the experimenter picked up the bell as if to ring it but did not ring it. There were 1-2 practice trials followed by 4 real, timed trials (10 s, 20 s, 30 s, and 15 s in length). Trial scores ranged from 1 to 9 (1 = child eats snack during part 1 [before the experimenter lifted the bell]; 2 = child eats snack during part 2 [after the experimenter lifted the bell]; 3 = child touches snack during part 1; 4 = child touches snack during part 2; 5 = child touches cup and/or bell during part 1; 6 = child touches cup and/or bell during part 2; 7 = child waits until bell is rung. Up to two extra points were given if the child kept his/her hands on the table). Snack delay total scores were averaged across trials and therefore the final score ranged from 1-9 (interrater reliability: T1 ICC = .98; T2 ICC = .98).

Language skills—The Preschool Language Scale—4th Edition (PLS-4; Zimmerman, Steiner, & Pond, 2002) Auditory Comprehension subtest was used to assess children's language skills. The Auditory Comprehension subtest focuses on precursors to language development, such as attention to speakers and appropriate object play, as well as comprehension of basic vocabulary, concepts, and grammatical markers. Test developers report test-retest reliability (mean, 6 days) ranging from .85 to .95 and internal consistency (Cronbach's α) ranging from .91 to .94 for 2- to 4-year-old children (Zimmerman, Steiner, & Pond, 2002). In the current sample, Cronbach's α was .82.

Parental education—Parents reported on the educational attainment of the first and second main caregivers (in 90% of cases, first main caregiver was the mother; see Table 1) on a 10-point scale ranging from 1=middle school to 10=doctorate. For analyses, parent education categories were translated into approximate years of education. For two-caregiver households, the higher level of education was used.

Statistical Analyses

Descriptive statistics and preliminary analyses were conducted using SAS (version 9.3). Measurement models and structural equation model (SEM) analyses were conducted using Mplus version 7 (Muthén & Muthén, 1998-2012). All models were estimated using full information maximum likelihood (FIML), which maximizes the likelihood of missing values based on observed data and yields more statistically reliable standard errors compared to other methods of accounting for missing data (e.g., mean imputation, listwise deletion; Enders, 2001, 2010; Jelić, Phelps, & Lerner, 2009).

Children in our sample were nested within child care centers, and an intraclass correlation (ICC) indicated that 12% of the total variation in children's delay inhibition was attributable to differences between child care centers. Thus, we used a multilevel modeling approach, which captures the correlations across children (level 1) within child care centers (level 2) through the estimation of random effects (Raudenbush & Bryk, 2002).

Measurement models were estimated to examine whether the observed delay inhibition indicators loaded on the delay inhibition latent factor and to evaluate factorial invariance over time. In the context of longitudinal research designs, factorial invariance means that the same construct is being measured across time points. Evidence of factorial invariance is necessary for longitudinal comparisons to rule out the possibility that changes are the result of a change in the construct over time. To test factorial invariance, we used a series of nested confirmatory factor analysis (CFA) models (Widaman, Ferrer, & Conger, 2010). Recent research suggests using alternative fit indices rather than chi-square difference tests for nested model comparisons. Thus, in the current analyses two models were considered to have equivalent fit if the decrease in the comparative fit index (CFI) was $\geq .01$ and if the increase in the root mean square error of approximation (RMSEA) was $\leq .01$ (Chen, 2007; Cheung & Rensvold, 2002).

SEMs were used to examine whether parental responsiveness and directive language predict T2 delay inhibition after accounting for initial (T1) levels of delay inhibition, age, gender, T1 language skills, and parental education. Measurement models and SEMs were evaluated for overall fit using the chi-square goodness-of-fit test, RMSEA, CFI, and standardized root mean squared residual (SRMR). Adequate model fit is traditionally indicated by a non-significant chi-square; however, with larger samples, it is possible to get significant chi-squares even for models that fit the data well (Bentler & Bonett, 1980). An RMSEA $\leq .06$, a CFI $\geq .95$, and an SRMR $< .08$ indicated good model fit (Hu & Bentler, 1999). An RMSEA $\leq .08$ and CFI $> .90$ indicated moderate fit (Brown, 2006).

Results

Preliminary Analyses

Inspection of the distributional properties of each variable indicated that most variables were normally distributed but some exhibited mild skew and/or kurtosis. More specifically, skewness ranged from -1.59 to 1.14 and kurtosis ranged from -.96 to 3.06 (see Table 2). Previous SEM studies have indicated that skew values greater than 3 (Curran, West, & Finch, 1996) and kurtosis values greater than 10 (Kline, 2011) can result in model misspecification. Given that none of the variables exceeded these cut-offs, the distributions of the variables used in analyses were not expected to affect our findings.

We then examined whether potential covariates, including child age, gender, race/ethnicity, language skills, parental education, parent marital status, one- or two-parent household, intervention condition, site, and cohort, were associated with predictor and outcome variables. Correlations for age, gender, parental education, and child language skills are presented in Table 3. Child race/ethnicity was not associated with parental directive language, $F(2,47)=1.39$, *ns*, or child delay inhibition, $F(2,318)=.85$, *ns*, but parental responsiveness was lower for African American children compared to Caucasian/White children, $F(2,125)=5.41$, $p<.01$. However, race/ethnicity was not significant in any of the main analyses and thus was dropped from the final models. Intervention status, parental marital status, number of parents in the household, site, and cohort were not associated with parental responsiveness, parental directive language, or child delay inhibition, $F(1-2, 56-282)=.05-1.89$, *ns*. Based on these analyses, age, gender, parental education, and child language skills were included as covariates in main analyses.

Confirmatory Factor Analyses and Factorial Invariance

Correlations among the three delay inhibition tasks ranged from .33 to .38 ($p<.001$) at T1 and from .34 to .45 ($p<.001$) at T2 (see Table 3). As expected, the delay inhibition latent factor model fit the data well at both T1, $\chi^2(3) = 9.42$, $p<.05$, RMSEA = .07, CFI = .95, SRMR = .02, and T2, $\chi^2(3) = 8.52$, $p<.05$, RMSEA = .07, CFI = .97, SRMR = .02. T1 gift delay – wrap (.53), T1 gift delay-bow (.70), and T1 snack delay (.61) loaded on the T1 delay inhibition factor. T2 gift delay – wrap (.56), T2 gift delay-bow (.81), and T2 snack delay (.59) loaded on the T2 delay inhibition factor. At both T1 and T2, the delay inhibition latent factor exhibited significant variance ($p<.001$).

We then examined factorial invariance to assess whether the contribution of individual tasks to the underlying delay inhibition latent factor changed across time. Analyses supported configural invariance, $\chi^2(20) = 44.33$, $p<.01$, RMSEA = .05, CFI = .95, SRMR = .04, weak factorial invariance (factor loadings were invariant across time), $\chi^2(22) = 45.54$, $p<.01$, RMSEA = .05, CFI = .95, SRMR = .04, and strong factorial invariance (factor loadings and intercepts were invariant across time), $\chi^2(25) = 46.56$, $p<.01$, RMSEA = .05, CFI = .95, SRMR = .04. Evaluating the models sequentially using the criteria based on change in CFI and RMSEA (Chen, 2007) suggest there are no significant differences between models and thus there is evidence for strong factorial invariance in the delay inhibition factor.

Descriptive Statistics

Descriptive statistics are presented in Table 2, and zero-order correlations are presented in Table 3. Parents tended to demonstrate moderate levels of both warm acceptance and responsiveness/flexibility, but the full range of the 5-point scale was observed in this sample. On average, 21% of the total play-related utterances were directives. However, there was considerable variability across parents with the percentage of directives ranging from 2 to 65%. Parental responsiveness was positively associated with T1 and T2 delay inhibition, whereas parental directive language was negatively associated with T1 and T2 delay inhibition. Parental responsiveness and directives were negatively correlated. There were no significant mean-level increases in performance on the gift delay-wrap, paired $t(327) = .42$, ns , gift delay-bow, paired $t(320) = .09$, ns , or snack delay tasks, paired $t(298) = .37$, ns , from T1 to T2.

Parental Responsiveness and Child Delay Inhibition

As shown in Table 4, the model demonstrated adequate fit to the data. Parental responsiveness was significantly positively associated with T2 delay inhibition ($\beta = .12$) after accounting for age, gender, parental education, T1 language skills, and T1 delay inhibition. Child age, gender, parental education, and T1 language skills were not significantly associated with T2 delay inhibition. T1 delay inhibition significantly predicted T2 delay inhibition, $\beta = .68$, indicating high stability of delay inhibition across time points.

Parental Directives and Child Delay Inhibition

This model also fit the data well (see Table 4). Parental directive language was significantly negatively associated with T2 delay inhibition skills, $\beta = -.28$. Age, gender, parental education, and T1 language skills were not significantly associated with T2 delay inhibition. T1 delay inhibition significantly predicted T2 delay inhibition, $\beta = .69$.

Parental Responsiveness, Parental Directives, and Child Delay Inhibition

The model examining the unique contributions of parental responsiveness and directive language fit the data well (see Table 4). Parental directive language significantly negatively predicted T2 delay inhibition ($\beta = -.32$) after controlling age, gender, parental education, T1 language skills, and T1 delay inhibition (see Figure 1). Parental responsiveness was no longer a significant predictor of T2 delay inhibition ($\beta = .05$). Age, gender, parental education, and T1 language skills were not significantly associated with T2 delay inhibition. T1 delay inhibition significantly predicted T2 delay inhibition, $\beta = .64$.

Discussion

The goal of this study was to examine the longitudinal associations between specific parenting factors and delay inhibition in socioeconomically disadvantaged preschoolers. Delay inhibition, an EF process defined as the ability to suppress automatic responses or control impulses in the context of an appealing reward, plays an important role in school readiness and later emotional and behavioral competence (Kim et al., 2013). Although parenting is theorized to influence delay inhibition development, the specific parenting factors that are associated with delay inhibition are not well-understood. Findings from this

study were expected to fill this gap in the literature and inform the design of parenting interventions that reduce socioeconomic disparities in children's early development.

When examined alone, parental responsiveness was significantly positively associated with delay inhibition after accounting for child age, child gender, parental education, child language skills, and initial levels of delay inhibition. This result is consistent with previous research on middle- to upper-SES children (Razza & Raymond, 2013). Parental responsiveness behaviors, including staying attuned to the child, accurately interpreting child cues, and flexibly adjusting to the child's play interests, may promote the early development of delay inhibition. These parenting behaviors may contribute to the formation of a secure parent-child attachment relationship which regulates the child's stress-response system and supports EF development (Bernier, Carlson, Deschenes, & Matte-Gagne, 2012; Blair et al., 2011). Another explanation is that these parenting behaviors facilitate children's autonomy and sense of volition (Grolnick & Ryan, 1989).

In a separate model, parental directive language was significantly negatively associated with delay inhibition. This result is consistent with prior studies showing that parental directive language is negatively correlated with child cognitive and EF outcomes (Bindman et al., 2013). Frequent parental directive language may reflect low autonomy support and high control over the child's play, which prevents the child from making choices or taking an active role in decision-making (Grolnick & Ryan, 1989).

These findings do not rule out the possibility that parental directive language may be beneficial to children in some circumstances. For instance, prior research has shown that frequent parental directives were associated with greater social and cognitive competence at younger ages (e.g., 2 years of age; Landry, Smith, Swank, & Miller-Loncar, 2000). In addition, parental directives can be helpful when children are off task or when directives follow or elaborate on a child's expressed interest (e.g., Masur, Flynn, & Eichorst, 2005). Future studies that code different types of directives may further our understanding of the circumstances in which parental directives are beneficial to child development. Also, coding physical directiveness may shed light on the extent to which parental physical behavior aligns with the level of control suggested by the frequency of verbal directives.

When the two parenting factors were entered simultaneously, we did not find additive contributions, but rather that directive language remained the only significant predictor. This result aligns with previous research highlighting autonomy support and scaffolding, a similar construct, as robust predictors of children's EF (Bernier, Carlson, & Whipple, 2010; Hammond et al., 2012). It is possible that parental responsiveness and directive language have similar mechanisms with regard to delay inhibition. Both parental responsiveness and parental directive language may modulate the degree of choice the child is allotted during parent-child interactions. Parental responsiveness may provide more autonomy whereas frequent parental directives may indicate a controlling parental style. Another possibility is that parental directive language represents a mediator of the effect of parental responsiveness on children's delay inhibition. An interesting remaining question is whether these findings are specific to delay inhibition or whether they would generalize to other EF components.

The longitudinal design of this study reduces the possibility that the opposite direction of effect, that is, from child to parent, explains the results. Nonetheless, parents may use more directives with children who have poorer delay inhibition skills and are less able to regulate their own behavior. For instance, findings from a longitudinal study indicated that children's effortful control skills predicted parental use of directive strategies (Eisenberg et al., 2010). Therefore, it is important for future research to examine the possibility of bidirectional effects.

Parental education was positively associated with delay inhibition in zero-order correlations but not a significant predictor of delay inhibition once other variables were taken into account. It is possible that parental education effects were accounted for by other variables in the model or mediated by parenting behavior. Given that family income data were not available, we could not examine associations between family income and children's delay inhibition. In addition, child language skills were positively associated with delay inhibition in zero-order correlations but not after accounting for other variables in the model. Future research should be conducted to clarify the role of child language skills in the early development of delay inhibition, given that prior studies suggest that language skills may mediate parenting effects on children's EF (Hammond et al., 2012; Landry, Miller-Loncar, Smith, & Swank, 2002; Matte-Gagné & Bernier, 2011).

Findings from this study may generalize to low-SES populations and inform the design of interventions targeting the improvement of children's self-regulatory skills. Parental management language should be evaluated and addressed when appropriate in low-SES families. Parenting interventions should address controlling or intrusive parental behavior by including training in how to guide children without interfering with their autonomy. This topic may be important to address in parenting components of preschool or Head Start programs that aim to improve children's early development (e.g., Love et al., 2005).

Strengths of this study include a relatively large sample size and the use of observations of parenting behavior and transcripts of videotaped parent-child play sessions to achieve precise measures of parental responsiveness and directive language. In addition, delay inhibition was assessed using multiple tasks, and we employed rigorous statistical procedures, involving SEM and a comprehensive set of covariates.

There are also limitations of this study that should be kept in mind when interpreting results. We were only able to transcribe 45% of the parent-child free play videos. However, our results did not yield any evidence of bias in the sample of children whose videos were transcribed. This was a short-term longitudinal study in which T1 and T2 were only three months apart. There was no mean-level change in delay inhibition from T1 to T2, possibly because of the brief time span or individual differences in change over time. Future studies should examine these research questions over a longer period of time; a longer time span might result in developmental changes and perhaps a different model. In addition, our parenting measures were based on a single parent-child free play session, and therefore the data only hold to the extent that parenting quality demonstrated during this session was representative of parenting quality in everyday life. Although the children in the sample varied by intervention status, there were no intervention effects that needed to be controlled.

This study found that parental responsiveness and parental directive language both predicted delay inhibition in socioeconomically disadvantaged preschoolers when examined separately. However, when entered simultaneously, only parental directive language accounted for unique variance in delay inhibition. These findings suggest that frequent parental directive language may impede delay inhibition development during early childhood, possibly by interfering with children's autonomy. In the context of preventative early interventions, parental levels of control, including directive language, should be evaluated. Addressing parental controlling behavior may be important in facilitating early delay inhibition development among children in lower SES environments. Parenting interventions that support children gradually gaining increased autonomy may be effective in promoting school readiness and positive long-term outcomes.

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Figure 1. Standardized path coefficients for the final model. Covariates are not pictured. Circles represent latent variables and rectangles represent observed variables. Dashed lines represent non-significant paths; all other paths are statistically significant.

Table 1**Sample characteristics**

	<i>M(SD) or %</i>	<i>n</i>
Child age (years) at Time 1	3.21 (.54)	303
Child gender (male)	48	308
Child race/ethnicity		299
African American	78	
Caucasian/White	8	
Hispanic/Latino	14	
First main caregiver's relation to child		305
Mother	90	
Father	5	
Grandmother	4	
Other	1	
First main caregiver marital status		307
Never married, divorced, or separated	62	
Married	38	
Single-parent household	45	304
First main caregiver education		305
High school diploma or less	28	
Some college	50	
Bachelor's degree or more	22	
First main caregiver education (years)	13.59 (2.13)	305
Qualified for free/reduced lunch program	58	237

Table 2
Descriptive statistics for parental responsiveness, parental directive language, and child delay inhibition

	Time 1					Time 2						
	N	M	SD	Range	Skew	Kurtosis	N	M	SD	Range	Skew	Kurtosis
Parental warm acceptance	284	3.61	1.06	1-5	-.32	-.62	--	--	--	--	--	--
Parental responsiveness/ flexibility	284	3.52	1.02	1-5	-.26	-.43	--	--	--	--	--	--
Parental directive language	127	.21	.12	.02-.65	1.14	1.61	--	--	--	--	--	--
Child language skills-/	258	38.99	7.98	12-59	.06	-.20	--	--	--	--	--	--
Child delay inhibition												
Gift delay - wrap												
Latency to peek	328	18.30	24.34	0-60	1.02	-.76	328	20.78	23.77	0-60	.84	-.96
Strategy	328	2.56	1.28	1-5	.83	-.37	328	2.61	1.23	1-5	.84	-.32
Gift delay - bow												
Latency to touch	311	86.36	38.48	0-120	-1.04	-.14	311	83.59	41.36	0-120	-.79	-.85
Strategy	321	2.98	1.01	1-4	-.74	-.56	321	2.94	1.09	1-4	-.66	-.89
Snack delay	299	7.84	1.23	3-9	-1.25	1.48	299	7.84	1.21	2-9	-1.59	3.06

Note. Parental directive language was the percentage of directives out of the total number of play-related utterances.

I Preschool Language Scale-4 Auditory Comprehension raw score

Table 3
Bivariate correlations among parental responsiveness, parental directives, and child delay inhibition

	1	2	3	4	5	6	7	8	9	10	11	12
1. Age	--											
2. Gender	-.02	--										
3. Parental education	-.01	-.01	--									
4. Parental responsiveness	.08	.13*	.25***	--								
5. Parental directive language	-.36***	-.15 ⁺	-.20*	-.33***	--							
6. T1 language skills /	.63***	.12*	.21***	.30***	-.38***	--						
7. T1 gift delay – wrap	.41***	.15**	.06	.12 ⁺	-.04	.34***	--					
8. T1 gift delay – bow	.25***	.05	.21***	.28***	-.26**	.34***	.35***	--				
9. T1 snack delay	.32***	.18***	.07	.20**	-.12	.34***	.33***	.38***	--			
10. T2 gift delay – wrap	.45***	.16**	.08	.14*	-.23*	.45***	.50***	.35***	.19***	--		
11. T2 gift delay – bow	.24***	.13*	.11 ⁺	.28***	-.39***	.32***	.31***	.52***	.24***	.45***	--	
12. T2 snack delay	.33***	.13*	.13*	.18**	-.34***	.27***	.25***	.28***	.34***	.34***	.44***	--

Note. Child gender was coded 0=male, 1=female. Parental directive language was the percentage of play-related utterances that were directives.

*I*₇ Preschool Language Scale-4 Auditory Comprehension raw score

⁺ $p < .10$,

* $p < .05$,

** $p < .01$,

*** $p < .001$

Table 4

Fit indices for structural equation models

Model	χ^2	df	RMSEA	CFI	SRMR
Parental responsiveness	116.12***	48	.05	.93	.05
Parental directive language	109.62***	48	.05	.94	.05
Unique contributions of parental responsiveness and directive language	115.57***	53	.05	.94	.05

Note. CFI, comparative fit index; RMSEA, root-mean-square error of approximation; SRMR, standardized root mean squared residual.

 $p < .001$