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The effect of family processes on school achievement as moderated by socioeconomic context☆

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ABSTRACT

This longitudinal study examined a model of early school achievement in reading and math, as it varies by socioeconomic context, using data from the NICHD Study of Early Child Care and Youth Development. A conceptual model was tested that included features of family stress, early parenting, and school readiness, through both a single-group analysis and also a multiple-group analysis. Latent profile analysis was used to identify subgroups of more advantaged and less advantaged families. Family stress and parenting were shown to operate differently depending on the socioeconomic context, whereas child-based school readiness characteristics were shown to operate similarly across socieodemographic contexts. Implications for intervention are discussed.

1. Introduction

Academic competence and attainment are essential features of the social and economic fabric of the United States. Importantly, early academic achievement is highly predictive of long term educational outcomes and occupational attainment in adulthood. In this regard, Ceci and Williams (1997) concluded that the economic benefits of education are "clear and unambiguous" (p. 1051). Early educational achievement, however, is not equally distributed across different socioeconomic gradients in the United States. Children from lower income families do not fare as well academically as do children from more advantaged families (Bradley & Corwyn, 2003; Entwisle & Alexander, 1999; Smith, Brooks-Gunn, & Klebanov, 1997). The National Institute of Child Health and Development (NICHD) Early Child Care Research Network (ECCRN, 2005) reported that children in the lowest income group (defined as

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persistently poor, 200% of the poverty threshold) start out 1 standard deviation below the mean on a composite of cognitive/language skills at age 2 and remain in the lowest rank throughout their early educational experiences to age 8.5. In their book, "Consequences of Growing Up Poor," which examined the outcomes of poverty using multiple large longitudinal data sets, Duncan and Brooks-Gunn (1997) concluded that poverty, especially when experienced during early childhood, has a significantly large effect on educational achievement and cognitive ability. It is necessary to identify the underlying mechanisms leading to academic outcomes for diverse groups, especially for those groups who are economically disadvantaged and at risk for low academic attainment.

In attempts to understand the influence of economic disadvantage and child developmental outcomes (e.g., emotional, behavioral, and academic outcomes), researchers have focused on two broad models termed the Family Investment Model and the Family Stress Model (for review of these models see Conger & Donnellan, 2007). Both the Family Stress Model and the Family Investment Model seek to explain how socioeconomic disadvantage negatively influences parenting that then decreases positive child outcomes, such as academic achievement. Briefly stated, the Family Investment Model is based on the principle that financial strain reduces parental capacity for investment in child developmental outcomes. That is, lower-income parents are less able to provide for cognitively stimulating activities and opportunities. Challenges in parenting and provision of resources in turn reduce child academic achievement and accounts for the influence of income on child outcomes. The Family Stress Model is based on the perspective that families who experience financial strain have increased forms of stress (e.g., depression, exposure to stressful life events, marital conflict) and that these forms of stress reduce parents' capacity to respond to their child sensitively, which then has an inverse association with positive child outcomes.

What is clear from empirical tests of both the Family Stress Model and the Family Investment Model is that early parenting plays a crucial role in enhancing children's developmental outcomes generally, and academic achievement specifically (see Conger & Donnellan, 2007). Moreover, research on parenting practices (e.g., parental sensitivity and home environment) stemming from Family Stress Model and Family Investment Model has demonstrated that these practices mediate the influence of socioeconomic disadvantage on academic achievement (Burchinal, Roberts, Hooper, & Zeisel, 2000; ECCRN, 2005; Guo & Harris, 2000; Smith et al., 1997; Yeung, Linver, & Brooks-Gunn, 2002). Typically, researchers have focused on models of mediation because their aim has been to account for the relation between socioeconomic disadvantage and child outcomes (Bradley & Corwyn, 2002).

The current study, however, takes a unique perspective with regard to family stressors and parenting practices and focuses on the *moderating* effect of socioeconomic disadvantage on family stressors and parenting practices, which we will refer to as family processes. As explained by Bradley and Corwyn (2002) "moderator models are concerned with the conditions in which the process operates" (p. 387). Thus, the aims of this study were not to account for the relationship between early disadvantage and distal child outcomes but rather to examine how family processes vary by socioeconomic context. That is, to illuminate the important potential interactions between socioeconomic context and family processes (Bradley & Corwyn, 2002; Fairchild & McQuillin, 2010). Few other studies have addressed the moderating influence of socioeconomic disadvantage on the relationship between family processes and child outcomes (Bradley & Corwyn, 2002; Duncan et al., 2007; Lugo-Gil & Tamis-LeMonda, 2008; Raver, Gershoff, & Aber, 2007). This gap in the literature not only represents a limitation in our current knowledge, but also highlights a potential limitation in intervention service aimed at preparing children for school success. If family processes themselves vary as a function of socioeconomic context, we should extend our understanding of how such family processes operate within different socioeconomic contexts (i.e., advantaged versus disadvantaged contexts). Accordingly, intervention practice should be designed to address factors relevant to family processes among children at-risk for school problems. In other words, universal intervention services, based on the results of general population studies, might not be as efficient as intervention services designed to meet the specific needs of economically disadvantaged children. The current study aimed to address this gap by examining socioeconomic context as a moderator of family processes.

1.1. Family processes: Stress related antecedents and parenting practices

Quality of cognitive stimulation and support in the home environment and parental sensitivity represent two domains of parenting that have been studied extensively with respect to child

developmental outcomes. Both have been shown to be important predictors of cognitive performance and academic achievement (Downer & Pianta, 2006; Duncan, Brooks-Gunn, & Klebanov, 1994; ECCRN, 2005; Guo & Harris, 2000; Yeung et al., 2002). There is evidence that parenting, in the form of a stimulating home environment and sensitive parenting, is negatively influenced by family risk factors that include stressful life events, parenting stress, and maternal depression. These factors operate by depleting parental capacity to provide cognitive stimulation and to respond sensitively (Bradley & Whiteside-Mansell, 1997; McLoyd, 1990). Importantly, there is some evidence in the literature that at least two of these factors, stressful life events and parenting stress, are moderated by socioeconomic disadvantage. Bradley and Corwyn (2002), in comparing models of moderation and mediation argued that if "researchers obtain weak or inconsistent results when investigating a particular association, it often implicates a moderator effect" (p. 387). Stressful life events are not only a correlate of poverty (Attar, Guerra, & Tolan, 1994; Brooks-Gunn, Klebanov, & Liaw, 1995; Burchinal et al., 2000) but also a predictor of parenting practices (Burchinal et al., 2000). However, inconsistencies are noted in the literature. Burchinal et al. (2000) found life events were negatively correlated with quality of stimulation in the home environment as measured by the Home Observation for Measurement of the Environment (HOME) total score, a measure of quality parenting practices (Caldwell & Bradley, 1984). Conversely, Brooks-Gunn et al. (1995) found that stressful life events did not predict parenting behavior in particular, while Gershoff, Aber, Raver, and Lennon (2007) showed that material hardship, defined as a stressful life event, was positively correlated with positive parenting—an unexpected finding. These inconsistent findings, based on different samples, may actually be an indication that the effect of stressful life events is moderated by some other factor.

Parenting stress is also an important antecedent to parenting practices (Feldman, Eidelman, & Rotenberg, 2004). Feldman et al. (2004) reported significant associations between parenting stress and later parenting sensitivity and infant cognitive development. In a sample of low-income young children, Ritchie and Holden (1998) found that parenting stress predicted maternal affection and punitive parenting practices. However, Dilworth-Bart, Khurshid, and Vandell (2007) noted that the relation between parenting stress and income is not necessarily strong and may require a sample with a significant proportion of lower-income families to detect (Reitman, Currier, & Stickle, 2002), which again implicates a potential moderator effect.

Depression is another important form of stress that is related to decreasing parents' capacity to respond sensitively (Jackson, Brooks-Gunn, Huang, & Glassman, 2000; Trapolini, Ungerer, & McMahon, 2008). Depression is related to more negative and intrusive parenting or withdrawn and passive parenting (Field, 2010). These findings in the literature are consistent and indicate that depression is a risk factor that decreases sensitive parenting. However, we were not able to identify studies that have tested whether or not depression is related to the quality of the home environment as measured by the HOME scale. It is reasonable to expect depression to be negatively associated with the ability of parents to provide a cognitively stimulating home environment (e.g., engaging in teaching activities). Very little is known about this potential pathway of risk.

1.2. School readiness: Child level contributions to academic achievement

Several studies have suggested that a child's own *school readiness*, broadly termed as a child's *readiness to learn* (Konold & Pianta, 2005), is an important contributor to academic achievement (Duncan & Magnuson, 2005). A child's school entry cognitive capacity has been positively associated with their later academic achievement. For example, La Paro and Pianta (2000) documented that early language abilities have a positive association with academic attainment. In prior studies, parenting practice including parental sensitivity (La Paro, Justice, Skibbe, & Pianta, 2004) and parental provision of a stimulating home environment (Morisset, Barnard, & Booth, 1995) have been linked to early language abilities. Early language skills are also negatively associated with parental lower socioeconomic status (Bradley & Whiteside-Mansell, 1997) and its correlates, such as low maternal education (Dollaghan et al., 1999) and young maternal age at birth of first child (Dubow & Luster, 1990).

Several studies have documented that a child's personal competencies are important predictors of academic achievement. For example, the ability to pay attention to school related tasks and manage attention is a skill that enhances the capacity of children to function within the classroom (Blair, 2002). Alexander, Entwisle, and Dauber (1993) found that the ability to sustain attention predicts academic

achievement. Attention has also been shown to mediate the relation between early parenting (i.e., quality of the stimulation in the home environment and sensitive parenting) and academic achievement (ECCRN, 2003). Duncan et al. (2007) found that school entry attention skills were related to achievement in math, reading, and verbal scores during middle childhood across five data sets that measured school entry skills, even after controlling for prior cognitive achievement, prior attention skills, and other background measures. Moreover, lower attention scores are more likely to occur in lower socioeconomic status children (Dilworth-Bart et al., 2007; Mezzacappa, 2004) and may be an especially important indicator of risk for disadvantaged kindergartners (Howse, Lange, Farran, & Boyles, 2003).

Finally, high social competence and its related characteristics have been linked to school success and a positive transition into the school environment (Ramey & Ramey, 1999), although findings are somewhat mixed. Classroom compliance (Ladd, Birch, & Buhs, 2003) and cooperation (Agostin & Bain, 1997) are associated with higher achievement. It may be that cooperative, prosocial, and compliant children are able to get along better with peers and teachers as well as take greater advantage of the learning environment. However, in more comprehensive models with extensive lists of control variables, such as the work by Duncan et al. (2007), prosocial orientation or positive social skill ratings were not predictive of academic outcomes. In sum, children contribute to their own achievement through the assets that they bring to the school setting (Duncan & Magnuson, 2005).

1.3. The current study

The studies reviewed here illustrate the importance of family processes and school readiness for academic attainment. Moreover, to better understand and therefore effectively intervene in early family processes that support academic achievement, we must consider whether these family processes vary or interact with socioeconomic context. Relevant to the context of disadvantage, we therefore suggest specific interactions as they relate to family processes.

First, we hypothesized that both stressful life events and parenting stress will have a stronger negative effect for those within a context of socioeconomic disadvantage. The rationale is that those in disadvantaged contexts have fewer resources by which to ameliorate stress; under conditions of socioeconomic disadvantage, then, these risk factors become more potent because the environmental context offers fewer buffers. We hypothesized that those in a more advantaged context will be buffered, to a degree, from the impact of both stressful life events and parenting stress, in part because those in advantaged contexts would have fewer types of stress overall (i.e., lower mean level of stress) and would have better access to resources within which to manage stress relative to those in a disadvantaged context. As Cowan, Cowan, Ablow, Johnson, and Measelle (2005) have argued, life stressors challenge families' coping capacities.

In contrast to our hypotheses regarding stressful life events and parenting stress, we hypothesized that socioeconomic context would not moderate the impact of depression on parenting. In part, this is because maternal depression decreases a parent's emotional availability to the child, and the effect of low emotional availability is not necessarily buffered by other supports or material resources because it occurs in the context of a relationship. Depression in this study was measured as actively experiencing depressive symptoms. It may be that those in an advantaged context have a higher probability of receiving medical treatment for their depression, relative to those in a disadvantaged context; however, those who are experiencing symptoms, regardless of context, will be less emotionally available to their child and less sensitive to their child's needs.

We also hypothesized that early parenting practices (i.e., stimulating home environment and parenting sensitivity) would be more important for those in a disadvantaged context and that these factors would directly enhance academic competence in first grade for disadvantaged children, as these are important precursors to school achievement. This rationale stems from the literature on resiliency, such that those children who are exposed to significant adversity in their life are more resilient when they have strong supportive family relationships and processes (Masten, Shaffer, Clarke-Stewart, & Dunn, 2006). We also argued, for both groups, that parenting would affect school achievement as mediated by school readiness. In other words, we did not hypothesize an interaction for the mediated pathway from early parenting to early achievement via school readiness. In both an advantaged context and a disadvantaged context,

stimulating home environment and parenting sensitivity would support the development of preschool language and prosocial orientation while decreasing problems with attention.

Finally, we expected school readiness to operate similarly for children regardless of context. Difficulties with attention, for example, would negatively affect all children, even though disadvantaged children might have a higher probability of inattention. In the same way, we expected both preschool language and prosocial orientation to enhance academic achievement, regardless of context. Fig. 1 presents these expectations. Dashed lines represent hypothesized interactions between socioeconomic context and family stressors and parenting practices; all dashed lines represent stronger positive or stronger negative effects for those families in a disadvantaged context. Solid lines represent processes that we hypothesize do not interact with socioeconomic context.

Another important consideration is that socioeconomic disadvantage is multifaceted. Indicators widely used to represent socioeconomic status (e.g., income, education, and family structure) are highly correlated and difficult to disentangle (Burchinal, Vernon-Feagans, & Cox, 2008). Therefore, using latent profile analysis, we empirically incorporated such interwoven associations among different socioeconomic status indicators in the current study rather than choosing one individual indicator over the others.

2. Method

2.1. Participants

This study was based on secondary analysis of data from the NICHD Study of Early Child Care and Youth Development (NICHD SECCYD), a comprehensive longitudinal study examining early childcare experiences and a broad range of child developmental outcomes (ECCRN, 1994).

Participants in the NICHD SECCYD were recruited from January to November of 1991 from hospitals located in the 10 locations across the United States. A conditionally random sampling plan was used to ensure that the recruited families (a) included mothers who planned to work or to go to school full time (60%) or part time (20%) in the child's first year, as well as some who planned to say at home with the child (20%) and (b) reflected the economic, educational, and racial/ethnic diversity of the data collection sites. Exclusionary criteria used were (a) mothers 18 years or younger at the time of the child's birth, (b) families planning to move from the catchment area within 3 years, (c) children with disabilities at birth or who remained in the hospital more than 7 days postpartum, and (d) mothers not sufficiently conversant in English. During selected 24-hour sampling periods, all 8986 women who gave birth at the selected hospitals were screened, and of those screened, 5416 met the eligibility criteria for the study. From that group, 1364 children and their families became the NICHD SECCYD sample upon completing a home interview when the infants were one month old, and they have been followed over the past 19 years. At enrollment, mothers had an average of 14.4 years of education and were an average age of 28.11 years old; 20% of the study children were in minority racial/ethnic groups and 52% were males.

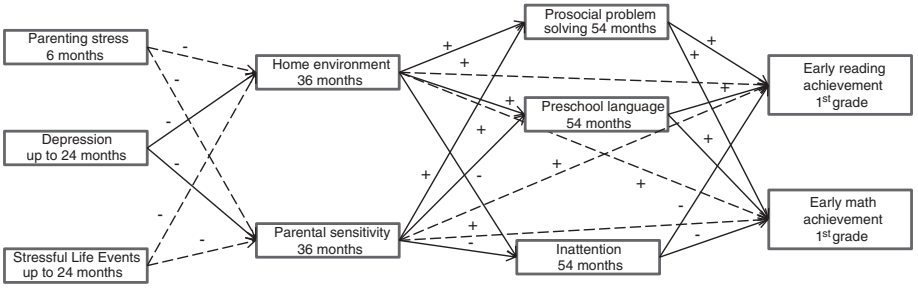

Fig. 1. Family processes: A model of early school achievement. Dashed lines represent pathways hypothesized to be statistically significantly different by socioeconomic group status (with the direction of effect noted by the plus and minus symbols). All dashed pathways are hypothesized to be stronger (in a positive or negative direction) in the Disadvantaged group relative to the Advantaged group.

Data collection methods for the SECCYD study included observations, interviews, questionnaires, and testing. To ensure the integrity of the data collection process, multiple procedures were implemented (ECCRN, 2001). For example, those involved in the data collection process were provided with identical training materials and manuals. Research visitors also participated in centralized training workshops and submitted videotaped examples of several administrations of each measure for certification (ECCRN, 2001). The timing of data collection for the SECCYD study was guided by multiple developmental theories including life course perspective and primacy of early experience hypothesis (ECCRN, 2001). Additional details about recruitment and selection procedures are available in prior publications from the study (see ECCRN, 2001, 2005) and in the study web site (http://secc.rti.org).

2.2. Measures

2.2.1. Measures used to identify socioeconomic disadvantage/advantage

Mothers reported their own age (in years) and education (in years) at target child's age of one month. Presence of biological father in the home family during early childhood was assessed by interview separately at 1, 6, 15, and 24 months, and then combined into a single derived variable for the present study. At each interview, mothers reported whether or not they lived with the biological father of the study child (Yes = 1, No = 0). We calculated a proportion of the interviews that mothers responded 1 to this item. Economic status during early childhood (i.e., household income) was an average of income-to-needs ratios at 1, 6, 15, and 24 months. Income-to-needs ratios at each interview were calculated by dividing total annual household income by the U.S. poverty threshold (also known as the U.S. poverty line) adjusted for the appropriate family size. A lower income-to-needs ratio implied a lower degree of economic resources.

2.2.2. Measures for the path analysis

2.2.2.1. Antecedents to parenting during birth to 24 months. The Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977; Roberts, 1980; Roberts & Vernon, 1983) was used to assess parental depression at 6, 15, and 24 months. Twenty depressive symptoms were rated on a 4-point scale at each interview (0 = *rarely or none of the time*, 1 = *some or a little of the time*, 2 = *occasionally or a moderate amount of time*, 3 = *most or all of the time*). Example items included "I was bothered by things that usually don't bother me," "I felt lonely," and "I had crying spells." Responses were scored at each wave and then averaged into a single derived variable for each respondent ($\alpha = .89$ for the scale at 6 months, $\alpha = .90$ for the scale at 15 months, $\alpha = .91$ for the scale at 24 months). Parenting stress was assessed at ages 1 and 6 months with the Parenting Stress Index (PSI-SF; Abidin, 1983). Twenty-five items measuring subscales of attachment, restrictions of role, and sense of competence, were extracted from the 101-item PSI. These items were designed to identify parent–child systems under stress (Abidin, 1983) and were scored by parents on a 5-point scale (1 = *Strongly disagree*, 2 = *Disagree*, 3 = *Not Sure*, 4 = *Agree*, and 5 = *Strongly agree*). Example items included "Being a parent is harder than I thought it would be," "when my baby came home from the hospital, I had doubtful feelings about my ability to handle being a parent," and "it takes a long time for parents to develop close, warm feelings for their babies." The scored items were summed at each wave, and subsequently the sums were averaged into a single derived variable for each respondent ($\alpha = .85$ for the scale at 1 month, $\alpha = .82$ for the scale at 6 months). Finally, stressful life events were defined as the average number of potentially stressful family life events reported at 6, 15, and 24 months. The list of stressful life events included entrance into a new household group, exit from an existing household group, job loss of a relative or close friend, illness of a relative or close friend, death of a relative or close friend, household moves, and job loss.

2.2.2.2. Parenting practice at 36 months of age. The stimulating home environment was assessed with the Home Observation for Measurement of the Environment (HOME; Caldwell & Bradley, 1984; Bradley, 1994). Fifty-five dichotomous items assessed the quality and quantity of cognitive stimulation and parental support available to a child in the child's home environment, and endorsed items were converted into a total score ($\alpha = .86$). Example items included "2 or more toys which teach colors, sizes, and shapes are available to child," "mother's voice conveys positive feelings about child," and "at least 1 musical instrument is available to the child." Parental sensitivity was measured using

videotaped semi-structured procedures at the 36 month interview that assessed parenting behaviors and child behaviors (Egeland & Hiester, 1993). In the procedures, caregivers were asked to have their children play with toys in three containers in a specified order. The first container held washable markers, stencils, and paper; the second container had dress-up clothes and a cash register; and the third container held Duplo blocks and a picture of a model. The recorded procedures were rated by trained coders using 7-point ratings (1 = *Very low* and 7 = *Very High*) with regard to different aspects of parenting behaviors such as caregivers' supportive presence, respect for child's autonomy, cognitive stimulation, hostility, and confidence (ECCRN, 1999). The intraclass correlation between two coders, a measure of intercoder reliability, was .84 (ECCRN, 1999). For the present analysis, scores regarding three aspects of parenting behaviors including caregivers' supportive presence, respect for child's autonomy, and hostility were combined into a composite variable. Higher scores corresponded to more support, autonomy, and less hostility ($\alpha = .78$).

2.2.2.3. Child school readiness at 54 months of age. Prosocial problem solving was based on a subset of the Social Problem-Solving Test-Revised (Rubin, 1983). In the test, the child was presented with five situations relating to object acquisition and then asked what to do to handle the situations. Children's responses were coded into 15 categories of actions. For the present study, ratios of (a) the number of responses coded as one of five positive action categories (e.g., "wait," "fair share, turns," and "plan for future") to (b) the total number of responses were calculated and then categorized using .5 and .8 as thresholds (0 = "0 <= ratio < .5," .5 = ".5 <= ratio < .8," and 1 = ".8 <= ratio < 1"). Of note, these thresholds were empirically derived; quartile information for the precategorized variable was used as a basis for creating these thresholds. Preschool language development was assessed with the Preschool Language Scale (PLS-3; Zimmerman, Steiner, & Pond, 1979) at the 54-month interview. The PLS-3 includes two standardized subscales: Auditory Comprehension (AD) and Expressive Communication (EC). What children know, but may not say, is assessed in the AD whereas what children actually say is measured in the EC. The tests were administered in an order of the AD and the EC. Each item-level response was scored as 1 when the pass criterion was met or the child self-corrected a response or as 0 when the pass criterion was not met or responses were partially correct or incomplete. Scores were summed and converted into standard scores ($M = 100$, $SD = 15$) in accordance with the scale manual.

Finally, inattention was measured with the Continuous Performance Test (CPT) designed to assess child's sustained attention (Barkley, 1994; Barkley, Grodzinsky, & DuPaul, 1992; Halperin, Sharma, Greenblatt, & Schwartz, 1991). In the test, images of familiar objects (e.g., butterfly and fish) randomly appeared in a computer screen, and children were asked to press a button when they saw the target object (a chair) in the screen. Once the test session begins, the stimuli (object images) are presented in 22 blocks. Ten stimuli are presented in each block. The target stimulus (chair) is randomly presented twice within each block. For children at 54 months of age the test takes approximately 7 min and for 1st grade children the test takes approximately 8.5 min. The CPT is a widely used measure of sustained attention and has adequate test–retest reliability evidence ($rs = .65$ to .74; Halperin et al., 1991) and good predictive and discriminate validity evidence (Barkley, 1994; Barkley, DuPaul, & McMurray, 1990; Barkley et al., 1992; Epstein et al., 2003). The number of instances in which a child failed to respond to the target object (ranging from 0 to 41) was used in the present analysis.

2.2.2.4. Outcome variables, early school achievement during first grade. Two tests from the Woodcock–Johnson Psycho Educational Battery-Revised (WJ-R; McGrew, Werder, & Woodcock, 1991), Letter–Word Identification and Applied Problems (Woodcock & Mather, 1989, 1990), were administered while the children were in first grade to assess early reading and math achievement. The Letter–Word Identification test includes 57 items. Symbolic learning, or the ability to match a representation of a word with an actual picture of the object, was assessed in the first five items. The remaining items were designed to assess a child's letter and word identification skills. The Applied Problems test includes 60 items assessing skills in analyzing and solving practical problems in mathematics (Woodcock & Mather, 1989, 1990). Correct responses were scored 1 and incorrect responses were scored 0. The raw scores, the number of correct responses, were converted into the standard score by using a mean of 100 and a standard deviation of 15 as a base. Internal consistency reliability was reasonably high for each test ($\alpha = .92$ for Letter–Word Identification and $\alpha = .83$ for Applied Problems).

2.3. Analytic strategy

To identify subgroups of advantaged and disadvantaged families, a latent profile analysis was carried out using Mplus 5.1. A latent profile analysis classifies individuals into subgroups based on the covariance of relevant observed indicators. More details about a latent profile analysis are available elsewhere (Collins & Lanza, 2010; Hagenaars & McCutcheon, 2002; McCutcheon, 1987). In line with prior studies (Muthén & Muthén, 2000; Tofighi & Enders, 2007), the number of classes chosen was based on model fit statistics, sufficient class sizes, and the theoretical meaningfulness of the solution. The four measures of family socioeconomic status described above were included as indicators of the resulting categorical latent variable.

In the second analysis[1], a path analysis, designed for estimating linear effects of paths between variables (Bollen, 1989), was used to estimate the hypothesized model of the family processes and child's school readiness on early school achievement using Mplus 5.1. Based on previous research findings, parenting stress, stressful life events, and parental depression were modeled as being distal risk factors for parenting practices. Parenting practices and child's school readiness were modeled as being proximate predictors of early school achievement (refer to the Fig. 1 for the visual presentation of the analysis model).

First, we conducted a path analysis for the full sample. We evaluated the fit of our hypothesized path model using the Comparative Fit Index (CFI), Root-Mean-Square Error of Approximation (RMSEA), the Standardized Root Mean Square Residual (SRMR), and a χ^2 test. Hu and Bentler (1999) recommend a CFI $\geq$ .95, RMSEA $\leq$ .06, and SRMR $\leq$ .08 as guidelines for acceptable fit. As for the χ^2 test, a nonsignificant χ^2 statistic indicated that the hypothesized model fit the data adequately. However, with large sample sizes, Kline (1998) recommended dividing the χ^2 by the degrees of freedom to provide adequate adjustment for having large sample sizes. With this adjustment, a value of 3 or less indicated acceptable fit.

To examine whether socioeconomic disadvantage, as defined in this study, was a significant moderator of the hypothesized process, we estimated a multiple group path model and assessed whether the estimated path coefficients varied across different socioeconomic groups using a Wald test. A statistically significant Wald test in the context of the present study indicated that hypothesized processes in the model varied across different socioeconomic groups. To identify potential misfit in the hypothesized model, we examined modification indexes with caution. We were aware that additional paths identified through modification indexes can be potentially spurious. However, we concluded that it was important to examine other potential processes relevant to early school achievement. Finally, missingness in the data was handled with full-information maximum likelihood (FIML) in Mplus, which has become preferable over traditional strategies for managing incomplete data (Schafer & Graham, 2002).

3. Results

3.1. Latent classes of socioeconomic disadvantage/advantage

Model testing for the latent profile analysis began with one, two, and three class models. Although the three-class model fit the data better than the two-class model according to the BIC values (three-class model = 19,170 and two-class model = 19,764) and the Lo–Mendell–Rubin Adjusted Likelihood-Ratio test value (613, $p < .01$), the entropy for the three class model was .949 and the two-class model was .996. Both models identified the same disadvantaged subpopulation class as composing 17% of the sample; the three-class model identified an additional class consisting of a highly advantaged subpopulation representing the upper end of the distribution (9% of the sample) on the socioeconomic variables. This class demonstrated an average income-to-needs ratio of 9.3, an average maternal age of 33.1, and an average education of 16.8 years, and had the biological father in the home 99% of the time. The characteristics of the disadvantaged class were very similar in two and three class models; the means of indicators of the disadvantaged group were essentially identical across two and three class models. Because the aim of this

[1] To examine whether there is a need to address potential cluster issue in the data, we ran unconditional means (i.e., the most basic multilevel modeling) model for all seven dependent variables. Out of seven models, six unconditional model results showed non-significant variance in the mean of corresponding variable (τ_{00} for each variable) across sites. In addition, all the intraclass correlations (ICC) were below .05 (Peugh, 2010) except for the home environment variable (ICC = .096). Based on these sensitivity tests, we concluded that adjustment for sites was not needed for the current analyses.

study was to examine the family process model for those in a disadvantaged group relative to the remaining sample, the two-class model was accepted based on parsimonious conceptual interpretation along with consideration of model fit to the data.

Table 1 presents descriptive statistics of indicators included in the latent profile analysis for the full sample and by each latent class. Eighty-three percent of the sample belonged to the first class (denoted as the Advantaged group) who, on average, had a few years of post high school education, were in their late 20s at the birth of the study child, had the biological father of the study child present in the home for the majority of the first two years of the child's life, and had an average income-to-needs ratio of 3.79. The other class (denoted as the Disadvantaged group) composed 17% of the sample, and on average, had a high school education, were in their early 20s, lived in primarily female-headed households without a biological father for the first two years of the child's life, and had a low income-to-needs ratio of 1.29. We also examined differences between the groups with regard to parenting and school readiness using bivariate tests (using class membership as a predictor), which are reported in Table 1.

3.2. Socioeconomic disadvantage, family stress, parenting, and early school achievement

Path analyses were conducted on the full study sample and on socioeconomic groups identified in the previous latent class analysis to examine whether socioeconomic group was a significant moderator of the impact of family stress on early parenting and child outcomes. The covariance matrix for all the measures used in the path analyses is presented in Table 2.

First, we conducted a path analysis for the full sample (see Fig. 1). The model fit the data reasonably with a CFI of .97 and RMSEA of .05. However, $\chi^2/df = 4.9$ ($\chi^2 = 83.48$, $df = 17$) was slightly larger than 3. For the full sample, stressful life events and parental depression predicted home environment, standardized $\beta = -0.18$, $p < .001$ and standardized $\beta = -0.26$, $p < .001$, respectively and parental sensitivity, standardized $\beta = -0.15$, $p < .001$ and standardized $\beta = -0.23$, $p < .001$, respectively. Home environment and parental sensitivity were, in turn, associated with the increased child's pro-social solving skills, standardized $\beta = 0.18$, $p < .001$ and standardized $\beta = 0.14$, $p < .001$, respectively; higher preschool language development, standardized $\beta = .40$, $p < .001$ and standardized $\beta = .27$, $p < .001$, respectively; and

Table 1
Descriptive statistics and group difference.

Characteristic		Total sample '($N = 1363$)	Disadvantaged group ($n = 237$)	Advantaged group ($n = 1126$)
Maternal education[a]		14.23 (2.5)	12.49 (2.1)	14.6 (2.4)***
Maternal age[a]		28.11 (5.6)	23.79 (5.2)	29.02 (5.3)***
Income to needs ratio[a]		3.35 (2.7)	1.29 (1.3)	3.79 (2.7)***
Father in the home[a]		.83 (.3)	.11 (.2)	.98 (.1)***
Child's race/ethnicity[b]	Caucasian American	80.4%	48.7%	87.1%***
	African American	12.9%	40.8%	7.0%
	Asian American	1.6%	0.8%	1.8%
	Native American	0.4%	0%	0.4%
	Other	4.7%	9.7%	3.6%
Parenting stress[a]		51.83(9.7)	53.69 (10.94)	51.44 (9.32)***
Depression[a]		9.21(7.2)	13.06 (8.34)	8.43 (6.68)***
Stressful life events[a]		1.13 (.8)	1.56(.99)	1.04(.73)***
Home environment[a]		41.45(7.4)	35.11(7.97)	42.63(6.68)***
Parental sensitivity[a]		17.19 (2.78)	15.28(3.46)	17.53(2.49)***
Prosocial problem solving[a]		.61(.42)	.49(.44)	.64(.41)***
Preschool language[a]		99.63(20.39)	82.73(20.99)	101.84(19.5)***
Inattention[a]		9.14 (7.59)	10.89(7.18)	8.83(7.63)**
Early reading achievement[a]		111.99(15.79)	106.65(15.94)	112.97(15.57)***
Early math achievement[a]		110.8(17.14)	102.64(17.29)	112.3(16.69)***

Note.
[a] Group differences were tested using a bivariate regression analysis (with class membership = predictor).
*** $p < .001$.
[b] Group differences were tested using a χ^2 test.
** $p < .01$.

Table 2
Covariance matrices for Disadvantaged group and Advantaged group.

	1)	2)	3)	4)	5)	6)	7)	8)	9)	10)
1) Parenting stress		22.20	0.09	−4.05	−1.16	0.02	2.34	0.04	−1.31	1.42
2) Depression	51.89		1.33	−11.12	−3.82	−0.32	−23.83	5.48	−12.82	−16.34
3) Stressful life events	0.85	1.18		−0.96	−0.29	−0.03	−2.62	0.58	−1.52	−1.77
4) Home environment	−13.73	−13.34	−0.67		6.47	0.50	60.16	−12.46	26.96	35.67
5) Parental sensitivity	−8.31	−4.63	−0.34	8.81		0.18	19.45	−3.22	7.49	11.11
6) Prosocial problem solving	−0.46	−0.54	−0.05	1.19	0.33		2.06	−0.56	0.85	0.98
7) Preschool language	−58.77	−31.36	−0.49	87.72	30.97	3.82		−49.65	123.86	186.92
8) Inattention	11.25	6.46	0.67	−8.15	−5.16	−0.65	−47.01		−27.34	−38.80
9) Early reading achievement	−27.30	−27.26	0.39	46.68	20.12	1.19	133.84	−28.91		144.45
10) Early math achievement	−48.34	−30.12	−0.83	58.73	27.59	2.32	219.60	−34.36	166.69	

Note. Lower triangle = Disadvantaged group. Upper triangle = Advantaged group.

lower inattention, standardized β = −0.20, p<.001 and standardized β = −0.10, p = .003, respectively. Finally child's language development, inattention, and home environment were significant predictors of early reading, standardized β = 0.32, p<.001, standardized β = −0.10, p<.002, and standardized β = .10, p = .007, respectively. These three predictors, along with parental sensitivity, predicted early math achievement, standardized β = 0.51, p<.001, standardized β = −0.11, p<.001, standardized β = .07, p = .026, and standardized β = .08, p = .014, respectively. This model explained 20% of the variation in early reading achievement and 37% of the variation in early math achievement.

Next, we conducted a path analysis by socioeconomic group (e.g., the latent group membership identified in the latent class analysis). First, the model identified for the full sample was tested within a multiple-group analysis framework (see Fig. 2). Fit statistics for the multiple group model resulted in a χ^2/df value of 2.97 ($\chi^2 = 100.86$, $df = 34$) with a CFI value of .96 and a RMSEA value of .05 indicating a good model fit. Next, to explore potential unidentified processes, we examined the modification indices. According to the modification indices, a model fit could be improved by adding two additional paths to the

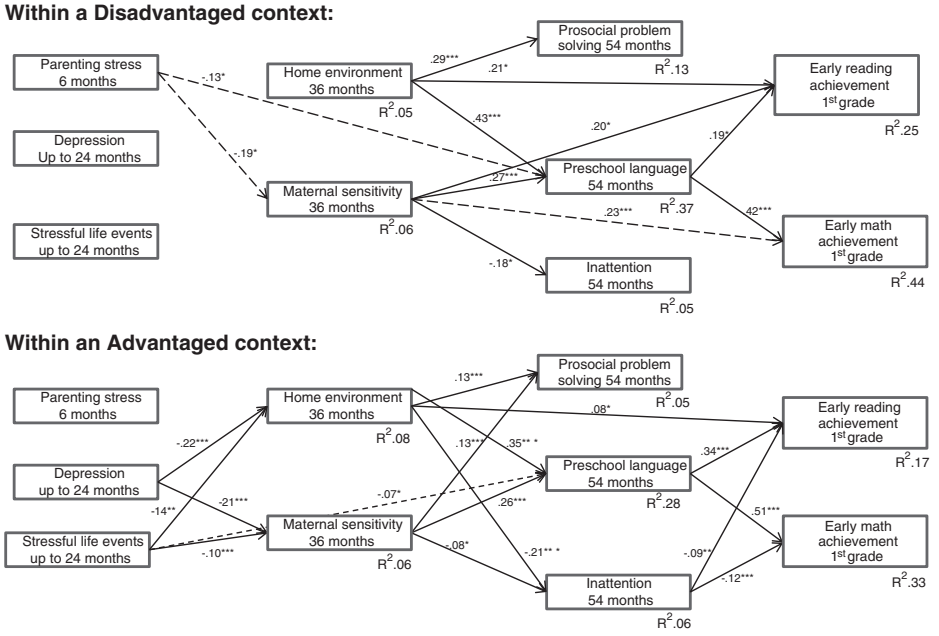

Fig. 2. A model of early school achievement within Advantaged and Disadvantaged contexts. For the within-group path analysis results, only statistically significant standardized effects are shown: *p<.05, **p<.01, and ***p<.001. For the multiple-group path analysis results, paths that vary between groups (with a statistically significant Wald value of p<.05) are marked by dashed lines.

model in the context of the multiple group analysis. Within the Advantaged group, a pathway between stressful life events and preschool language was statistically significant, and within the Disadvantaged group, a pathway between parenting stress and preschool language was statistically significant. We added these paths to the model, and the improvement in fit was significant, $\Delta\chi^2 = 13.01$, $df = 4$, $p < .05$. These additional paths were added to both groups in order to compare these paths between groups using Wald tests. Fit statistics for this re-specified model indicated a reasonable model fit to the data (CFI = .97, RMSEA = .05). Results are represented in Fig. 2.

In the Disadvantaged group, only parenting stress was a significant predictor of parental sensitivity, standardized $\beta = -0.19$, $p = .034$. Parenting stress, depression or stressful life events did not, however, predict the home environment. Both of these findings were unanticipated, especially the finding that depression was not predictive of parenting sensitivity. A follow-up analysis was conducted to assess a potential suppressor effect between depression and parenting stress that may influence the impact of depression on parenting sensitivity, which will be discussed further below. The correlation between parenting stress and depression was statistically significant and stronger for those in the Disadvantaged context ($r = .56$) than it was for those in the Advantaged context ($r = .36$). We examined the model without parenting stress and found that depression had a statistically significant impact on both the home environment ($\beta = -.18$, $p = .02$) and parental sensitivity ($\beta = -.06$, $p = .05$), both follow-up analyses provide evidence of a suppressor effect between depression and parenting stress, but it is evident only for those in the Disadvantaged group.

Home environment predicted pro-social problem solving, standardized $\beta = 0.29$, $p < .001$, and child's language development, standardized $\beta = 0.43$, $p < .001$. Parental sensitivity was associated with child's improved language development, standardized $\beta = 0.27$, $p < .001$, and decreased inattention, standardized $\beta = -0.18$, $p = 043$. Parenting stress also predicted child's language development, standardized $\beta = -0.13$, $p = .037$. Child's language development, home environment, and parental sensitivity were significant predictors of early reading achievement, standardized $\beta = 0.19$, $p = .038$, standardized $\beta = .21$, $p = .017$, and standardized $\beta = .20$, $p = .012$, respectively. Child's language development and parental sensitivity predicted early math achievement, standardized $\beta = 0.42$, $p < .001$ and standardized $\beta = 0.23$, $p = .001$, respectively. This model explained 25% of the variation in early reading and 44% of the variation early math achievement for the Disadvantaged group.

For the Advantaged group, stressful life events and parental depression were negatively related to both (a) home environment, standardized $\beta = -0.14$, $p < .001$ and standardized $\beta = -0.22$, $p < .001$, respectively, and (b) parental sensitivity, standardized $\beta = -0.10$, $p = .002$ and standardized $\beta = -0.21$, $p < .001$, respectively. Home environment and parental sensitivity predicted child's pro-social problem solving, standardized $\beta = 0.13$, $p < .001$ and standardized $\beta = 0.13$, $p < .001$, respectively. Home environment, parental sensitivity, and stressful life events predicted child's language development, standardized $\beta = 0.35$, $p < .001$, standardized $\beta = 0.26$, $p < .001$, and standardized $\beta = -0.07$, $p = .02$, respectively. Home environment and parental sensitivity predicted inattention, standardized $\beta = -0.21$, $p < .001$ and standardized $\beta = -0.08$, $p = .021$, respectively. And in turn, child's language development, inattention, and home environment predicted early reading achievement, standardized $\beta = 0.34$, $p < .001$, standardized $\beta = -0.09$, $p = .008$, and standardized $\beta = 0.08$, $p = .041$, respectively. Only child's language development and inattention problem predicted early math achievement, standardized $\beta = 0.51$, $p < .001$ and standardized $\beta = -0.12$, $p < .001$, respectively. This model explained 17% of the variation in early reading achievement and 33% of the variation in early math achievement for the Advantaged group (see Fig. 2).

As noted previously, we used Wald test, which, if statistically significant, indicates that estimated path coefficients vary across two identified socioeconomic subgroups. The following paths yielded statistically significant difference across groups: (a) parenting stress to parental sensitivity, $\chi 2 = 5$, $df = 1$, $p = .025$, (b) parenting stress to language development, $\chi 2 = 6.65$, $df = 1$, $p = .01$, (c) stressful life events to preschool language, $\chi 2 = 4.07$, $df = 1$, $p = .04$, and (d) parental sensitivity to early math achievement, $\chi 2 = 4.91$, $df = 1$, $p = .03$.

4. Discussion

The purpose of this study was to assess the effect of family processes (i.e., family stressors and parenting practices), as they varied by socioeconomic context, on academic achievement. The theoretical model

proposed identified which risk and protective factors (i.e., stressful life events, parenting stress, stimulating home environment, and parental sensitivity) would be moderated by socioeconomic context and which factors (i.e., depression and school readiness) would not be moderated by socioeconomic context. Of prime interest was how family processes support academic achievement within a disadvantaged context because of significant policy, prevention, and intervention implications. Identifying specific and malleable family processes that support achievement will improve both policy and services to families with fewer socioeconomic resources. Without a clear understanding of how family processes operate within a disadvantaged context, prevention and intervention targets may be misaligned with actual needs of struggling families.

The full sample path analysis results indicated that the proposed theoretical model performed as expected with a few exceptions. All model pathways proposed were statistically significant in the expected direction with the exception of parenting stress and prosocial problem solving. Thus, the full sample, a more generalized sample, demonstrated constructs from both the Family Investment Model and Family Stress Model predicted lower scores in parenting and that parenting predicted higher scores in readiness, which resulted in higher scores on early school achievement. These findings echo what we already have seen in the literature, that school readiness appears to be very important to school achievement, thus focusing intervention efforts on promoting school readiness, for generalized samples should improve overall school achievement (Duncan et al., 2007). Similar to what others have found (Downer & Pianta, 2006; Duncan et al., 2007), the effects of parenting practices were fully mediated (one exception in this study is that parental sensitivity had a small-predictive effect on early math achievement).

The primary aim of this study, however, was to examine variation in family processes by socioeconomic context. The results clearly indicated that risk and protective factors associated with family processes operate differently depending on context. Specifically, for those in the Disadvantaged context, parenting stress significantly reduced parenting sensitivity as well as preschool language performance whereas for those in the advantaged context, parenting stress did not emerge as a statistically significant predictor. Although these effects were considered small, it is interesting that parenting stress during the first 6 months had an enduring effect on parenting sensitivity at 36 months and on preschool language at 54 months, even after adjusting for other potent variables. The mean difference in parenting stress between those in Advantaged versus Disadvantaged contexts is informative (Cohen's $d = .22$), showing that Disadvantaged families experience more parenting stress. This finding is important because parenting stress reduces sensitivity which has both a direct and mediated protective effect on achievement, but this finding only surfaced for those experiencing socioeconomic disadvantage. In particular, parental sensitivity had a significant direct effect on math achievement for those in the Disadvantaged context, this effect was not evident in the more Advantaged sample. Reflecting on the results in the full sample, which showed a very small effect of parental sensitivity on math achievement, when the samples were analyzed separately it became clear that this protective process was more evident in the Disadvantaged group.

The protective effects of parental sensitivity maps onto the resiliency literature quite well; that is, children in families exposed to adversity fare better when there are supportive and strong family processes in place (Masten et al., 2006). Given that parental sensitivity operates in a particularly protective manner for students in the Disadvantaged context, prevention efforts aimed at supporting students and their families from a disadvantaged socioeconomic background should pay attention to parental sensitivity during the earliest years of life. Alternatively, quality of the home environment, operated in the same way for both Advantaged and Disadvantaged groups, suggesting cultivating, more broadly, quality in the home environment is important regardless of differences in students' socioeconomic contexts, and thus should be a target for universal prevention programs.

Finally, with regard to other stressors that parents might experience including depression, parenting stress, and stressful life events, we were surprised to see that depression was not predictive of parental sensitivity in the Disadvantaged group. As noted, we suspected a potential suppressor effect between parenting stress and depression, given the strong correlation of these indicators in the Disadvantaged group. Results of our follow-up analysis indicated that indeed there is evidence of a suppressor effect between depression and parenting stress for those in the Disadvantaged group. This result suggested that parenting stress and depression, for the Disadvantaged group, were more entangled than they were for the Advantaged group. Thus, we concluded that parenting stress was more potent for those experiencing socioeconomic disadvantaged in part because of its embedded relationship with depression. This view is

supported by Chang and Fine's (2007) research, using a sample of low-income adolescent mothers, on growth trajectories of parenting stress from infancy to preschool. They found that depression was the only parental factor that differentiated mothers' growth trajectory of parenting stress, and it was in the expected direction.

Another interesting finding in the current study was that the stressful life events measure was a significant predictor of preschool language for the Advantaged group but not for the Disadvantaged group. As noted, this relation was not initially hypothesized or modeled; yet we thought it worth noting. We had expected that stressful life events would be more potent for those in the Disadvantaged group. Indeed, those in the Disadvantaged group experienced significantly more stressful life events. We examined this result closely and looked for potential suppressor effects but did not identify any. We thus caution readers that this result needs further exploration and consideration.

4.1. Limitations of the study

We note some limitations of this study. The NICHD SECCYD sample is not nationally representative. Some potentially disadvantaged families were excluded from the study at the beginning (i.e., mothers under the age of 18, mothers living in an unsafe neighborhood, and mothers who do not speak English). Thus, the subsamples defined in this study represent relative disadvantage and advantage as measured in this sample. Those in the Disadvantaged sample were, on average, 23 years of age, which is not as young as one might find in a sample that, for example, included a large number of adolescent mothers. Nevertheless, Bornstein, Putnick, Suwalsky, and Gini (2006) found that parenting practices significantly improve, in a linear fashion, with parental age for younger mothers under the age of 27 when age is no longer a predictor of parenting practices. Taken together, caution in generalizing these results to other populations is necessary. The proposed model should be replicated in another sample, preferably one with a greater number of disadvantaged participants who were potentially excluded from this study due to the selection criteria. Finally, the measure of stressful life events was a measure of events that were conceptually associated with increased stress. All events were summed and treated equally, and thus, potential individual variation in perception of a specific life event as stressor was not captured. This individual difference could be fruitful in future studies examining family process.

4.2. Conclusion

As noted by Bradley and Corwyn (2002), a model that includes the effect of moderating factors will help identify which processes are more or less significant to populations of interest, and in the case of inconsistent findings in the literature, moderator models may be particularly informative. Assessing family processes as they are moderated by socioeconomic context may disentangle inconsistent findings in the literature as well as expose processes that may be malleable and suited to particular types of targeted interventions. In this study, we found family processes to be significantly different between socioeconomic groups. The implication is that interventions should be informed by and then tailored to the needs and stresses particular to the context of the recipients. This recommendation is relevant for those engaged in research as well as those working with children in the educational system. School psychologists, teachers, and administrators interact with children every day who are struggling to succeed. Many children enter school at a significant academic disadvantage that is evident long before formal school entry (Duncan & Brooks-Gunn, 1997; ECCRN, 2003) and remains relatively stable (Alexander & Entwisle, 1988). Yet, educational professionals, school psychologists, and teachers serving children K-12 have the task of averting school failure even though we know the process that predicts problems begins prior to school entry and prior to the availability of services designed to improve achievement trajectories. The current findings demonstrate the importance of family processes in students' school achievement. Prevention efforts focusing on family processes in early childhood may stave off the need for school age intervention and expenditures related to academic underachievement. Also, cultivating the connection between school settings and families can enhance educational professionals' capacity to promote students' school success.

Studies have consistently reported that the success of effective early childhood intervention programs stem from their multifaceted program focus. Successful programs have not only intervention components

directly targeting at students' educational achievement but also program components nurturing sensitive and stimulating caregiving practices and mitigating families' stress (for review see Slavin, Karweit, & Wasik, 1994). Moreover, prevention and intervention services during the birth-to-three developmental period have shown that parental sensitivity, in particular, is malleable and responsive to interventions (Bakermans-Kranenburg, van Ijzendoorn, & Juffer, 2003). Developing a deeper understanding of the developmental pathways toward school achievement and acknowledging influences of broader ecological contexts other than educational settings on school success will improve educational professionals' capacity in guiding educational policy, intervention, and prevention efforts.

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