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Risk Factors for Learning-Related Behavior Problems at 24 Months of Age: Population-Based Estimates

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Abstract

We used a large sample of singleton children to estimate the effects of socioeconomic status (SES), race/ethnicity, gender, additional socio-demographics, gestational and birth factors, and parenting on children's risk for learning-related behavior problems at 24 months of age. We investigated to what extent these factors increased a child's risk of displaying inattention, a lack of task persistence, disinterest, non-cooperation, or frustration as he or she completed a series of cognitive and physical tasks with a non-caregiver. Results indicated that boys are about twice as likely as girls to display learning-related behavior problems. Children from lower SES households are about twice as likely as those from high SES households to display such behavior problems, which is largely attributable to the effects of having a mother with a low educational level. Statistically controlling for these factors, we found consistently significant patterns of elevated learning-related behavior problems for some Asian and Native American children. Results for African-American children were mixed. Hispanic children did not have elevated risks of problem behaviors. Only small portions of these effects are explained by variation in the children's gestational or birth characteristics. A significant portion, but still less than half of the socio-demographic effects are attributable to measured features of the children's parenting. This study helps provide population-based estimates of children's risk for learning-related behavior problems while at an age when early interventions are most effective.

A key feature of a child's readiness for schooling is the ability to self-regulate his or her behaviors while completing learning-related tasks (Ladd, Birch, & Buhs, 1999; McClelland, Acock, & Morrison, 2006; McClelland & Morrison, 2003). For example, a child entering school is expected to follow a teacher's directions, persist in completing activities, attend to instruction, and cooperate with his or her peers (Campbell & Stauffenberg, 2007). A child who arrives ready to meet a teacher's expectations for classroom behavior is much more likely to succeed in school (e.g., Duncan et al., 2007; Graziano, Reavis, Keane, & Calkins, 2007). However, some children enter school "behaviorally unready" (Campbell & Stauffenberg; National Institutes of Child and Human Development's [NICHD] Early Child Care Research Network, 2003). For example, they may not yet be ready to follow a teacher's directions or to work independently. School-aged children who fail to display learning-related behaviors are significantly less likely to succeed academically (e.g., Alexander, Entwisle, & Bauber, 1993; McClelland, Morrison, & Holmes, 2000). For instance, Duncan et al. (2007) found that inattention predicted lower academic achievement, even after statistically controlling for prior academic and cognitive ability. McClelland et al.'s analyses indicated that a kindergarten child's learning-related behaviors predicted his or her reading and mathematics skills in 2nd grade, even after statistically controlling for his or her reading and mathematics skills at kindergarten, as well as the child's IQ, age at school entry,

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preschool experiences, parent's education, ethnicity, and home literacy environment. Young children who are unable to self-regulate their learning-related behaviors are also at increased risk for more serious emotional and behavioral disorders (Egger & Angold, 2006; Hill, Degnan, Calkins, & Keane, 2006; Holmes, Slaughter, & Kashani, 2001; Hughes & Ensor, 2007). Keenan and Shaw (2003) identified deficits in self-regulation as causal factors in the etiology of psychopathology. Empirical studies repeatedly find a link between early delays in self-regulation and the later occurrence of psychopathology (e.g., Campbell, Shaw, & Gilliom, 2000; Essex et al., 2006; Hill et al.; Lengua, 2006). This link is evident in studies of infants, toddlers, school-aged children, and adolescents (Calkins & Fox, 2002).

Risk Factors for Learning-Related Behavior Problems

Three distinct sets of factors likely elevate a child's risk of learning-related behavior problems. The first set of factors can be characterized as the socio-demographic background of the child (e.g., the child's gender) or family (e.g., the family's SES). For example, children from low-income households are also more likely to live in low-quality neighborhoods, to be exposed to domestic and neighborhood violence and environmental toxins such as lead, to encounter residential insecurity, and to be raised by single mothers who are depressed, and/or who have dropped out of school (Duncan & Magnuson, 2005). These factors likely contribute to lower self-regulation (NICHD Early Childcare Research Network, 2005). Lengua (2005) recently reported that a family's income level, education level, and married status were negatively related to a child's irritability and inattention.

The second set of risk factors includes the conditions of the child's gestation (e.g., whether the mother smoke, drank, or otherwise put hers and the baby's health at risk during pregnancy) or birth (e.g., whether the child was born at low birthweight). Low birthweight elevates a child's risk for inattention (e.g., Hultman et al., 2007). Additional adverse events and exposures during pregnancy, delivery, and the newborn period have consistently been reported to be risk factors for cognitive delays and behavior problems. A child's inattention is linked to his or her mother's use during pregnancy of tobacco (Rodriguez & Bohlin, 2005), alcohol (Bhatara, Loudenberg, & Ellis, 2006), and illicit drugs (Noland et al., 2005), as well as her own level of psychosocial stress (O'Conner et al., 2002).

The third set of risk factors involves the quality of the child's parenting (e.g., NICHD Early Child Care Research Network, 2005). Elevated levels of psychological, social, and economic stress, combined with a low level of family resources, can reduce a mother's or father's ability to provide high-quality parenting (Conger et al., 1992; Conger, Ge, Elder, Lorenz, & Simmons, 1994), particularly when the child is fussy or irritable (Patterson, 2002). This, in conjunction with poor nutrition, lower levels of emotional comfort and physical safety in the home and neighborhood, and lower quality childcare outside the home, can result in behavioral unreadiness, such that the child enters school as inattentive, task-avoidant, easily frustrated, or noncompliant (Qi & Kaiser, 2003). In addition, children are more likely to respond with avoidant behavior when their parents practice relatively harsh or inconsistent discipline or physical aggression. Both Lengua (2006) and Lengua and Kovacs (2005) found that a mother's use of inconsistent discipline predicted greater irritability by her child. Inadequate parenting may also increase the negative effects of a child's socio-economic, gestational, or birth conditions (Bornstein, Hahn, Suwalsky, & Haynes, 2003). For example, meeting the low birthweight child's greater cognitive, behavioral, and physical needs may increase a parent's stress, which, in turn, may result in the child becoming more easily frustrated (Singer et al., 1999). Family poverty also increases the child's chances of being raised by highly stressed and unhealthy parents (Duncan & Brooks-Gunn, 2004). Stress and poor mental health negatively impact the quality of parent-child interaction, so that these parents become less warm and responsive, as well as harsher and more punitive

(Gallo, Bogart, Vranceanu, & Matthews, 2005; Hart & Risley, 1999). Yet high-quality parenting may help reduce the negative effects of the child's socio-economic, gestational, or birth conditions (e.g., Smith, Landry, & Swank, 2006). For instance, Tully, Arseneault, Caspi, Moffitt, and Morgan (2004) reported that maternal warmth lessened the effects of low birth weight on the occurrence of inattention. If higher-quality parenting mitigates a child's risk, then parenting might be a potential target of early interventions efforts. Yet few studies have investigated to what extent the quality of a child's parenting may mediate his or her risk of learning-related behavior problems, especially after accounting for a wide range of socio-demographic, gestational, and birth factors (Olson, Ceballo, & Park, 2002).

Study's Purpose

We investigated to what extent a wide range of socio-demographic, gestational, and birth factors elevate a young child's risk of displaying learning-related behavior problems. We also estimated the degree to which the child's parenting may mediate his or her risk of displaying such behaviors. To provide rigorously derived population-based estimates of these risk and mediating factors, we used a large sample of 24-month-old children participating in a nationally representative cohort study. These children were directly observed while completing a series of learning-related tasks with a non-caregiver. Such a setting should approximate the task demands, challenges, and frustrations that a child will later face in preschool- or school-based settings (Raikes, Robinson, Bradley, Raikes, & Ayoub, 2007). We estimated each factor's effect on each of five learning-related behavior problems (i.e., lack of task persistence, inattention, disinterest, frustration, non-cooperation). Our use of a large sample of very young children, many socio-demographic, gestational, birth, and parenting risk factors, and multiple indicators of learning-related behavior problems should help identify which groups of children, as toddlers, are already at elevated risk of entering school as behaviorally unready.

Method

Analytical Sample

The Early Childhood Longitudinal Study—Birth Cohort (ECLS-B) is a nationally representative, longitudinal cohort study of U.S. children born in 2001 (see <http://nces.ed.gov/ECLS/birth>). This cohort is based on birth certificate records and includes oversamples of Asian and Pacific Islanders, Native Americans and Alaska Natives, low birthweight (1,500-2,500 grams) and very low birthweight (less than 1,500 grams) children, and twins. At approximately 9 months (in years 2001-2002) and 24 months after the children's births (in 2003), ECLS-B field staff administered measures of the children's development. Field staff also interviewed the children's parents. The ECLS-B includes 5,522 observations from singleton births with complete data on the socio-demographic, gestational, and birth risk factors of interest, as well as behavioral measures at 24 months of age, and the two parenting measures.¹

¹We derived this sub-sample of 5,522 from the 8,944 children who participated in the ECLS-B's 24 months data collection, 7,222 of whom were singletons with complete data from their birth certificates, as well as complete assessment score data. Of these 7,222 children, 5,522 had complete data on the factors measured by the HOME score. We excluded non-singletons from our analyses because these children often lag substantially behind singletons in their cognitive abilities around 2 or 3 year time period (e.g., Rutter, Thorpe, Greenwood, Northstone, & Golding, 2003). Descriptive statistics (available from the study's first author) indicated that this sub-sample of 5,522 children were very similar in their socio-demographics to the full sample of 8,944 children participating in the ECLS-B at 24 months. Descriptive statistics of all the study's variables for the analytical sample are available by contacting the study's first author.

Measures

We analyzed interviewers' behavioral ratings of the children as they completed tasks designed to measure their cognitive functioning and physical skills. Specifically, we analyzed ratings on the Behavior Rating Scale-Research Edition (BRS-R). ECLS-B field staff used the BRS-R to rate children's behaviors as they worked to complete the Bayley Short Form—Research Edition (BSF-R), a modified version of the Bayley Scales of Infant Development, Second Edition (BSID-II; Bayley, 1993). The Bayley's items “challenge young children cognitively and require focused attention, persistence, and cooperation with an examiner” (Raikes et al., 2007, p. 134). The BSF-R includes both a mental and a motor scale. The mental scale measures the child's performance on tasks requiring memory, problem solving, and language skills. Example BSF-R mental scale items used for 24-month old children include “uses a three-word utterance,” “counts,” and “discriminates book, cube, and key.” The motor scale measures a child's gross and fine motor skills, such as his or her ability to grasp, stand, walk, run, and write. Example motor scale items used for 24-month-old children included “grasps pencil at nearest end,” “manipulates pencil in hand,” and “copies circle.” The BSF-R's standard errors indicated a reliability of above .80 for both the mental and motor scales. The R^2 between BSF-R and BSID-II scores was .99. This and root mean squared errors indicated that “under clinical conditions, the BSF-R item subsets were capable of predicting BSID-II ability estimates with considerable precision across a broad range of ability” (Andreassen & Fletcher, 2007, p. 4-8).

Learning-Related Behavior Problems—Interviewers used the BRS-R to rate a child's self-regulation (Bayley, 1993). At the 24 month ECLS-B assessment, NCES included 11 interviewer-rated items from the full BRS in the BRS-R. These items measured developmentally appropriate behaviors for 24-month-old children (Nord et al., 2006).² Raikes et al. (2007) report a Cronbach alpha of .92 for the BRS's self-regulatory (e.g., attention to task, persistence, cooperation) items. Our own analyses yielded a Cronbach alpha of .90. Scores on the BRS moderately-to-highly correlate with scores on other measures of young children's socio-emotional adjustment (Buck, 1997). We used five items on the BRS-R that measured learning-related behaviors. Each behavior was measured as the child completed the modified Bayley's cognitive and physical tasks. We dichotomized these ratings to better differentiate children displaying low, deficient, or problematic levels of the particular behavior from children displaying typical, sufficient, or non-problematic levels of the behavior. The first behavior was not persistent. Children were rated on a five-point scale where 1 represented “consistently lacks persistence” and 5 represented “consistently persistent in tasks.” The second behavior was not attentive. Children were rated along a five-point scale where 1 represented “constantly off task, does not attend” and 5 represented “constantly attends.” No interest was the third behavior. Children's interest in the testing material was rated from a 1 of “no interest” to a 5 of “constant interest.” Not cooperative was the fourth behavior. Children's reactions to suggestions or requests during test administration were rated on a five-point scale from a 1 of “consistently resists suggestions or requests” to a 5 of “consistently cooperates.” The fifth behavior was frustrated. Children's frustration with tasks during testing was rated from a 1 of “consistently becomes frustrated” to a 5 of “never becomes frustrated.” We dichotomized ratings for each of these learning-related behaviors, so that scores of 1 and 2 were coded as 1 and ratings of 3, 4, and 5 were coded as 0. Separate logistic regressions were run to predict each of these outcomes (Tables 1 and 3). We also combined these items to create a scale variable using the 5 behavioral variables of attentiveness, persistence, frustration, cooperation and interest. If the child exhibited a negative behavior to one of the variables (e.g., was rated as a 1 or 2 on

²For an extensive detailing of the training and reliability procedures used by NCES to prepare field staff to collect this and other behavioral data, see Andreassen and Fletcher (2007), which is publicly available at <http://nces.ed.gov/ECLS/birth>.

persistence), a 1 was scored for that variable. If the child did not exhibit a negative behavior (e.g., was rated as a 3, 4, or 5 on persistence), a 0 was scored for that variable. The child's score for each of these 5 specific behavioral variables were summed and the children with the highest 10% of the summed score were coded as consistently displaying learning-related behavior problems. This variable was then used as the outcome in logistic regression analyses (Table 4).

Socio-Demographic Characteristics—We included the child's age, gender, and race/ethnicity as risk factors, as well as his or her household's SES, mother's marital status, and whether an older mother was raising the child. Although the ECLS-B study design specified that the measures of children's development should be administered when the children were 24 months of age, in practice children's exact ages at the date when the assessment was administered varied. We therefore included the child's age in months when the measures were administered to account for age-related variation around the 24 month testing point. For child gender, we used females as the reference category, with male children coded as 1. For SES, ECLS-B project staff calculated this for a child's household using the following information, as reported by the child's parents: father or male guardian's education; mother or female guardian's education; father or male guardian's occupation; mother or female guardian's occupation; and household income. We used a five-category SES variable representing the quintile of the distribution for the value of the composite SES of each child. The first quintile represented the lowest SES, and the fifth quintile represented the highest SES. In cases where only one parent was raising the child, not all the aforementioned information was defined. In these cases, the household's SES was computed using the available information. In our logistic regression modeling, we used four dummy variables to represent increasingly lower SES, with the highest quintile designated as the reference category. Doing so allowed use to evaluate for possible nonlinear effects of SES. Our initial analyses used the combined SES score. These regressions consistently indicated that SES was a statistically significant and strong predictor of learning-related behavior problems. To better report on the policy implications of this finding, we then repeated these calculations, using the five components of SES (mother's and father's education and occupational status and family income) as predictors, one at a time.³ These follow-up analyses indicate that, overwhelmingly, the SES effect was due to the mother's education. Consequently, the tables presented here show the results when mother's education is the SES measure.

For older mothers, we used a dichotomous variable with a value equal to 1 for mothers aged 35 years or older at the time of the child's birth. We also used an indicator of the mother's marital status at the child's birth. We used married mothers as the reference category and coded unmarried mothers as 1. We used the race/ethnicity of the mother of the child to identify the child's race or ethnicity on his or her birth certificate, in accordance with National Center for Health Statistics procedures. We used Non-Hispanic White as the reference category. The other categories were as follows: (a) African American; (b) Korean, Chinese, Indian, or Japanese; (c) Other Asian (Filipino, Samoan, Vietnamese, Guamanian, Other Asian/Pacific Islander, and combined Asian/Pacific Islander); (d) Hispanic; and (e) Native American. Infants who were Korean, Chinese, Indian, and Japanese were considered separately from other Asians because children from these more economically developed Asian countries often score higher on cognitive tests (Goyette & Xie, 1999).

Gestational or Birth Characteristics—We included as risk factors medical and behavioral conditions, obstetric procedures, labor complications, being born very or moderately preterm or being born with very low or moderately low birthweight, and

³We thank the anonymous reviewer for suggesting this by-component analysis.

congenital anomalies. We used a count of the medical risk factors present during pregnancy from the following list: incompetent cervix, acute or chronic lung disease, chronic hypertension, pregnancy-induced hypertension, eclampsia, diabetes, hemoglobinopathy, cardiac disease, anemia, renal disease, genital herpes, oligohydramnios, uterine bleeding, Rh sensitization, previous birth weighing 4000+ grams, or previous preterm birth. We used a count of maternal behavioral risk factors occurring during pregnancy, as recorded on the birth certificate. Behavioral risks include any maternal use of alcohol and/or tobacco during pregnancy. We used a count of the following obstetric procedures occurring during pregnancy, labor and/or delivery: induction of labor, stimulation of labor, tocolysis, amniocentesis, and cesarean section. We used a count of the number of labor complications experienced from the following list: abruptio placenta, anesthetic complications, dysfunctional labor, breech/malpresentation, cephalopelvic disproportion, cord prolapse, fetal distress, excessive bleeding, fever of >100 degrees, moderate/heavy meconium, precipitous labor (<3 hours), prolonged labor (>20 hours), placenta previa, or seizures during labor. We used two indicators of preterm delivery. The first indicated very preterm births. This was equal to 1 for births occurring at ≤ 32 weeks completed gestation. The second indicate moderately preterm births. This was equal to 1 for birth occurring between 33 and 36 weeks completed gestation. We used two indicators for the child's birthweight. Very low birthweight was a dichotomous variable equal to 1 for births weighing ≤ 1500 grams. Moderately low birthweight was a dichotomous variable equal to 1 for births weighing 1,501-2,500 grams. To estimate the effects of congenital anomalies, we dichotomized this variable, so that a 1 was coded if any congenital anomaly was present at birth.

Parenting—We used two measures of parenting. The first consisted of NCES-collected items from the Home Observation for Measurement of the Environment (HOME) score (Caldwell & Bradley, 1984), a widely used measure of the quality of the child's parenting and the home environment (e.g., NICHD Early Childcare Research Network, 2005). The ECLS-B modified the measure, retaining a subset of the original measure's 21 items. The HOME score is constructed as a count of items measuring (a) parental activities including reading to the child, telling stories, singing, and taking the child on errands or to public places; (b) having toys, records, books, and audiotapes available in the home; and (c) having a safe and supportive home environment. Some of the HOME score's items were observational. Examples include “respondent responded verbally to the child,” “respondent caressed, kissed, or hugged the child,” “respondent spanked the child,” and “respondent kept child in view.” The interviewer directly asked the parent to respond to other items. Examples include “Do you take your child on errands?” “How often do you tell the child stories?” and “How many times do you spank your child?” Training procedures followed those used to certify field staff for the National Longitudinal Study of Youth and NICHD's Study of Early Child Care. The Cronbach alpha for the HOME score was .46, and so relatively low. NCES subsequently factor analyzed the scores. Their analyses identified four relatively distinct factors, three of which NCES characterized as “the child's language environment and cognitive stimulation,” “the parent's literacy-oriented activities with the child,” and “physical methods of managing the child's behavior” (Andreassen & Fletcher, 2007, p. 9-11). NCES did not characterize the fourth factor, which consisted of two items relating to the safety of the child's environment and the parent's supervision of the child. Because of the scale's relatively low internal inconsistency, NCES advises researchers to consider “other alternatives” rather than scaling the items. We therefore used (a) a count of the HOME scores items (i.e., peerand + ptells + psoft + ppull + ptalk + pnospank + rspeak + rverb + rhug + rnospank + pinter + rtoys + rview + rsafe), which we then (b) dichotomized to construct a measure of relatively low-quality parenting and home environment.

Specifically, we assigned the lowest 14% of HOME scores to a dichotomous score of 1 for having a low HOME score (≤ 8 points).

The second measure of parenting consisted of ratings of the quality of a parent's interactive support of their child, as coded from videotaped interactions during the Two Bags Task. This is a simplified version of the Three Bags Task, which was used in the Early Head Start Research and Evaluation Project and the NICHD Study of Early Child Care (Nord et al., 2006). Interviewers read a script to the child's parents, after which, over the next 10 minutes, parents were asked to play with their children. Parents were first asked to interact with their child over a children's picture book (i.e., *Goodnight Gorilla*). They were then asked to interact with their child with a set of toy dishes. Interviewers used handheld video cameras to film the parent and child as they interacted during these two activities. Coding of the videotaped interactions was the same as that for the original Three Bags Task developed for the Early Head Start Research and Evaluation Project and obtained from the measure's developers (Brady-Smith, O'Brien, Berlin, & Ware, 1999). Of the videotaped interactions, 99.2% consisted of mothers interacting with their children. The remainder consisted of interactions with fathers (0.4%), grandmothers (0.3%), or another relative (0.1%). A composite variable measuring parent support of the child was created for the ECLS-B representing the mean of 3 characteristics of parent interaction with the child. Each was scored on a 7 point scale, ranging from 1 = very low to 7 = very high. The first characteristic was parental sensitivity. This scale measures how the parent observed and responded to cues indicating whether or not the child was distressed. A parent who was observed to be sensitive interacted in ways that were child-centered, and was focused on responding to the child's needs, moods, interests, and capabilities. Parental stimulation of cognitive development was the second characteristic. This scale rated the parent's effortful teaching to enhance the child's perceptual, cognitive, and language development. Parents observed as stimulating a child's cognitive development interacted in ways that furthered the child's cognitive development, typically by using behaviors that were matched or slightly above the child's developmental level or interest. The third characteristic was parental positive regard. This scale measured the parent's warmth and responsiveness towards the child. Parents showing positive regard were observed as listening to the child, watching attentively, looking into the child's face when talking to him or her, as well as giving praise. Mean inter-rater reliability for the parent rating scales was 97%, with mean reliabilities of 97%, 93%, and 94% for sensitivity, cognitive stimulation, and positive regard, respectively (Andreassen & Fletcher, 2007). The composite parent support variable could range in value from 1 to 7. We used a dichotomous composite variable, such that the three lowest categories of parental support were coded 1 (i.e., relatively low support) and the remaining higher categories were coded 0. Both the HOME score and parent support measures were collected when the study's children were about 24 months of age.

Analyses

We estimated two multiple logistic regression models identifying factors that elevated a child's risk of displaying five separate learning-related behavior problems. Table 1 displays the estimates resulting from these models. The first of the models (i.e., Model 1) estimated to what extent a child's or family's socio-demographic characteristics (i.e., age, gender, mother's education, marital status, maternal age over 35, race or ethnicity) functioned as risk factors for the child's display of learning-related behavior problems at 24 months. The coefficients are expressed as the effect of the particular characteristic on the odds that a child was rated as displaying the particular learning-related behavior problem. The second model (i.e., Model 2) evaluated the degree to which the child's gestational and birth-related characteristics fully or partially mediated the effects of his or her socio-demographic characteristics. That is, we added these possibly mediating variables to the regression, and

examined the extent to which the effects of socio-demographic variables declined in magnitude as a result. Large declines indicate that the mediating variables are indeed accounting for portions of the effects of the socio-demographic variables' effects (Ullman & Bentler, 2004, see figure 19.7).

We then investigated the extent to which the quality of the child's parenting (as measured by the HOME score and parent support) fully or partially mediated the effects of the child's socio-demographic, gestational, and birth characteristics on each of these five learning-related behavior problems. For parenting to be identified as such a mediator, it must be correlated with the risk factor variable and, after adding parenting as a risk factor for the learning-related behavior, the other risk factor's effect must decrease or become statistically non-significant. We tested for these two conditions by first estimating the extent to which the child's socio-demographic (i.e., "Model 1"), and gestational, and birth-related characteristics (i.e., "Model 2") were associated with the (continuously-measured) HOME and parent support scores. The resulting regression coefficients are displayed in Table 2. Here we used the continuous version of the parenting measures in order to observe the full range of outcomes. However, we obtained similar results when we used the dichotomous version of these variables (i.e., low HOME and low parent support scores). We then added the dichotomous measures of low HOME and low parent support to the models previously used to identify risk factors of a child's learning-related behavior problems. Table 3 displays these re-estimated coefficients. We dichotomized parenting (i.e., low-quality parenting vs. not low-quality parenting) to evaluate whether low-quality parenting elevated a child's risk of displaying learning-related behavior problems. Collectively, these analyses helped establish whether such low-quality parenting mediated the effects of more exogenous risk factors on child learning-related behavior problems. Finally, in order to summarize our findings, we estimated logistic regressions predicting a child's chance of falling into the highest group on a scale measuring the consistency of learning-related behavior problems. This was done first using socio-demographics as predictors, then adding the gestational and birth risk factors, and finally adding the parenting measures to the equation. These estimates are presented in Table 4. In all of our regression analyses, we used sampling weights and design effects to appropriately account for oversampling and the stratified cluster design of the ECLS-B. We used SAS version 9.1 (with procedures surveymean, surveylogistic, and surveyreg) to conduct the study's analyses.

Results

Socio-Demographic, Gestational, and Birth Characteristics as Risk Factors

Table 1 indicates that older children were less likely to be rated as not task persistent, inattentive, disinterested, not cooperative, or frustrated while completing the cognitive tasks; however, only the first two of these effects were statistically significant. A child's gender was consistently a statistically significant risk factor. Boys, even as toddlers, are about twice as likely as girls to display learning-related behavior problems. These odds ratios ranged from 1.7 to 1.9. Low mother's education was also consistently a statistically significant risk factor. The odds that a child in the lowest mother's education quintile displayed a learning-related behavior problem were 2.1 to 2.8 times higher than those for a child from the highest mother's education quintile. The inattention and not cooperative odds ratios are particularly high. This pattern is also evident for children in the low-to-mid mother's education quintile, with the statistically significant odds ratios ranging from 1.8 to 2.3. Children in the middle mother's education quintile also have positive coefficients, but of smaller magnitude, in the 1.5-2.2 range. Contrasting Table 1's two columns of regression coefficients for each behavior, we see that adding a child's gestational and birth characteristics explains, at most, a small share of the effects otherwise attributable to his or her mother's education. Instead, the negative effects of low mother's education continue to occur, even after statistically

controlling for a child's gestational and birth characteristics. Thus, after statistically controlling for a range of gestational and birth risk factors, as well as additional socio-demographics, low mother's education continues to function as a risk factor for the occurrence of learning-related behavior problems in 24-month-old children.

Children of older mothers show modestly decreased odds of displaying learning-related behavior problems, and children of unmarried mothers show modestly increased odds. These effects are relatively uniform across each of the five behaviors. However, the effects are not large, and only occasionally reach statistical significance. The effects for African-Americans and Hispanics (compared to whites) are also modest in size, and only inconsistently reach statistical significance. The largest race/ethnicity effects occur for members of the Other Asian, Native American, and Mixed Race groups, particularly for displaying inattention or disinterest while completing the BSF-R's tasks. As with the mother's education effects, the race and ethnicity effects are not substantially mediated by a child's gestational or birth characteristics. Of these gestational and birth characteristics, being born very preterm significantly increases a child's risk of being non-cooperative. Very low birth weight increases the child's risk of displaying inattention or disinterest.

Low-Quality Parenting as a Risk Factor

We also investigated the extent to which parenting mediated the risks associated with the aforementioned socio-demographic, gestational, and birth characteristics. Table 2 displays regression coefficients for the scores on the two parenting measures (here measured as continuous variables) using the same risk factors as displayed in Table 1. These analyses evaluate a necessary condition for identifying parenting as a mediator. Specifically, do poorly educated mothers or those of Other Asian, Native American, or Mixed race/ethnicity score lower on ratings of parenting? Table 2 shows a strong, significant, and quite regular relationship between a mother's education and his or her scores on both measures of parenting quality. When compared to being in the highest mother's education quintile, being in the lowest quintile has the most negative relationship to parenting. This negative relationship consistently declines in magnitude for each successive mother's education quintile. The race/ethnicity categories are also, in general, negatively and statistically significantly related to parenting. Collectively, these results indicate that the first condition for parenting to function as a mediator of the mother's education or race/ethnicity effects indeed holds.

Mediating Effects of Low-Quality Parenting

Table 3 re-estimates the risk associated with the socio-demographic, gestational, and birth factors, while also statistically controlling the two measures of low parenting. That is, we repeat the regressions in the second columns of Table 1, but also add scores on the two parenting measures to the model. Because we are evaluating whether low-quality parenting is a risk factor for these five learning-related behaviors, we coded the parenting measures as dichotomous. Doing so allowed us to better evaluate low-quality parenting as a mediating risk factor. In 9 out of 10 cases, both measures of parenting problems have statistically significant effects on a child's inability to self-regulate his or her learning-related behaviors. (The only exception occurs for the estimated effect of low parental support on whether the child was rated as being frustrated. Its effect is directionally the same, but it does not reach statistical significance.) Poor parenting *is* a risk factor for a child's inability to self-regulate his or her learning-related behaviors at 24 months of age. This is evident even after statistically controlling for a wide range of potentially confounding risk factors.

To what extent does poor parenting explain the effects of mother's education and race/ethnicity on the early onset of learning-related behavior problems? Contrasting, for each

outcome, the lowest mother's education quintile's effect in the second column of Table 1 with its effect in Table 3, we find the following decreases in magnitude: for not persistent, from 2.1 to 1.8; for not attentive, from 2.6 to 2.2; for no interest, from 2.4 to 2.0; for not cooperative, from 2.6 to 2.1, and for frustrated, from 2.1 to 1.9. We observed the same pattern for the next mother's education quintile. These results indicate that low-quality parenting explains a portion of the effect of very low mother's education on the occurrence of these behaviors, and in some cases up to half of the effect. However, our results also indicate that at least 50% of the magnitude of these effects remains unexplained by poor parenting, as well as a wide range of gestational, birth, and other socio-demographic factors. As for the effects of race/ethnicity on the behaviors, the largest of these in Table 1 were for the Other Asian, Native American, and Mixed Race groups. When we compare the Other Asian effects in Table 1 and Table 3 we see the following decreases: not persistent, from 1.4 to 1.2; not attentive, from 2.0 to 1.5; no interest, from 1.9 to 1.5; not cooperative, from 1.3 to 1.0; frustrated, from 0.9 to 0.7, with this group's statistically significant effects wholly mediated by the inclusion of low-quality parenting. However, there is much less mediation for the effects of Native American on behavior problems. Of the four that were statistically significant in Table 1 (not attentive, no interest, not cooperative, and frustrated), all are still statistically significant after parenting is controlled in Table 3. There is some mediation for the effects of Mixed Race on learning-related behavior problems.

Finally, we combined the five behavior problems measures into a single scale, and estimated logistic regressions of a child's probability of falling into the extreme high end on this measure. The results are shown in Table 4. As before, Model 1 uses socio-demographics as predictors, Model 2 adds gestational and birth risk factors, and Model 3 adds the parenting measures. The results are generally similar to what we saw with the separate behavior problems measures. However, the effects of low mother's education are even larger than those estimated before. The evidence for a strong effect of low mother's education in increasing children's behavior problems is both strong and consistent. Further, we now observe a significant effect of greater behavior problems for African-American than for White children that is explained by the lower quality of African-American parenting. These mixed results for African American children leave the issue of their differential behavior from whites in need of further examination.

Discussion

We estimated whether and to what extent SES (and particularly a mother's education level), race/ethnicity, gender, other socio-demographics, gestational and birth characteristics, and parenting elevate a child's risk of displaying learning-related behavior problems at 24 months of age. Our analyses indicate that, even as young as 24 months of age, children vary substantially in their abilities to remain attentive, persistent, and cooperative while working with a non-caregiver to complete learning-related tasks. We found males and children from households in the two lowest mother's education quintiles were about twice as likely to display learning-related behavior problems at 24 months. We observed particularly strong effects for low mother's education on inattention, disinterest, and lack of cooperation in completing the BSF-R's tasks. Even while a child is quite young, only small portions of the mother's education effects were explained by the conditions of the child's gestation or birth. Regarding race or ethnicity, only the Other Asian, Native American, and Mixed Race groups showed consistently and statistically significant elevated rates of learning-related behavior problems. We also investigated parenting's role as a mediator, as this factor was measured relatively comprehensively (in addition to the HOME score, we were able to include a videotape-coded measure of parental support for the child during parent-child interaction). Regardless of the measure used, parenting was strongly and statistically significantly related to lower mother's education and the child's race/ethnicity, as well as to his or her display of

learning-related behavior problems. Parenting explained significant portions, but less than half, of the effects attributed to the mother's education and the child's race/ethnicity.

That children of racial and ethnic minority heritage and/or those being raised by less well educated mothers are more likely to display learning-related behavior problems prior to school entry has been reported by other investigators, but in samples of 4- and 5-year olds (e.g., Campbell & Stauffenberg, 2007; Magnuson & Waldfogel, 2005; also see Brooks-Gunn, Rouse, & McLanahan, 2007). Our results extend this finding to 24-month-old children, and identify a potential additional mechanism by which low-SES children's lower academic attainment may be explained. Specifically, low-SES children may lag behind academically because they enter school with fewer reading or mathematics skills *and* less well-developed learning-related behaviors. The mixed results for behavior problems differentials between African-American and white children leaves this issue in doubt. Prior research (Hillemeier, Farkas, Morgan, Martin, & Maczuga, in press) indicates that children from these racial/ethnic groups are at increased risk of displaying cognitive delay at 24 months, even after statistically controlling for the same set of gestational and birth risk factors used here. McClelland et al. (2000) reported that, by kindergarten, African-American children are at higher risk of displaying learning-related behavior problems. More research is needed on this issue. Additional research into the factors contributing to Native American and some Asian children's relatively higher risk of displaying learning-related behavior problems is necessary, particularly because investigations (e.g., Raver, Gershoff, Aber, 2007) typically do not include these groups of children when contrasting the mediating effects of SES and parenting on the school readiness of various racial/ethnic groups. Additional research is also necessary to identify *why* low level of education and, separately, low quality parenting elevate a young child's risk of displaying learning-related behavior problems.

Limitations

At least three limitations characterize this study. First, the ECLS-B does not report inter-rater reliability data on the BRS-R. Prior research, however, indicates that this measure does have relatively strong psychometric properties (e.g., Buck, 1997; Raikes et al., 2007). ECLS-B field staff also received extensive training in completing the BRS-R, as well as the study's other measures. Second, our analyses are restricted to identifying risk factors for the occurrence of learning-related behavior problems at 24 months. We are therefore unable to report on the extent to which the factors identified here as elevating a child's risk (e.g., low mother's education, low-quality parenting) continue to do so as the child ages, or whether additional factors (e.g., the child's birth characteristics) begin to exert increasingly negative effects. Third, we only measured the prevalence of these behaviors in one context (i.e., as the child worked at home with a non-caregiver to complete a series of tasks). Although the occurrence of these behaviors in such a context is clearly important (as such an interaction is an early approximation of the types of setting events, behavioral expectations, and task demands that the child will face in a preschool or school classroom), we are unable to identify risk factors for the occurrence of these behaviors in other types of contexts (i.e., outside of the home).

Study's Contributions and Implications

Our study extends prior research by analyzing data from a large-scale, non-high risk sample of children participating in a nationally representative study, as well as measures of a unusually extensive number of socio-demographic, gestational, birth, and parenting factors (McClelland et al., 2000; McClelland et al., 2006; Raikes et al., 2007; Schonberg & Shaw, 2007). By using such a sample and estimating a wide range of effects simultaneously, our analyses provide relatively precise estimates of any one factor's effects, and better identify

how these varying types of factors interact to elevate a child's risk (Farrington, 2005; Smeeckens, Riksen-Walraven, & Bakel, 2007). For example, the study's analyses indicate that certain socio-demographic factors, particularly whether the child's mother has a low educational level, considerably elevate the child's risk of displaying such behaviors, even at the very early age of 24 months. These socio-demographic effects were at most modestly mediated by a wide range of gestational or birth risk factors. Interventions designed to increase a child's behavioral readiness for school may therefore need to account for the negative effects that low mother's education has on a child's initial acquisition of learning-related behaviors. Put another way, our analyses indicate that social-service and policy interventions targeting the effects of low mother's education may be more effective in increasing a child's learning-related behaviors than clinic-based interventions designed to remediate the negative effects of a child's gestational or birth characteristics. Further, these interventions likely need to be introduced at very young ages if they are to effectively prevent or remediate a child from arriving at school as behaviorally unready (Patterson & Yoerger, 2002). Even as toddlers, some groups of children are already delayed in their ability to self-regulate their behaviors while completing learning-related tasks.

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Logistic Regression Models Estimating Socio-Demographic Risk Factors for Learning-Related Behavior Problems at 24 Months, without and with Statistical Controls for Gestational and Birth Risk Factors

Table 1

	Not persistent		Not attentive		No interest		Not cooperative		Frustrated	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Child age	0.9 (0.8-0.9) ***	0.9 (0.8-0.9) ***	0.9 (0.8-1.0) **	0.9 (0.8-1.0) **	0.9 (0.8-1.1)	0.9 (0.8-1.1)	0.9 (0.9-1.0)	0.9 (0.9-1.0)	0.9 (0.8-1.1)	0.9 (0.8-1.1)
Male	1.8 (1.5-2.2) ***	1.8 (1.6-2.2) ***	1.8 (1.5-2.1) ***	1.8 (1.5-2.1) ***	1.7 (1.4-2.0) ***	1.7 (1.4-2.0) ***	1.7 (1.5-2.0) ***	1.7 (1.5-2.0) ***	1.8 (1.5-2.2) ***	1.8 (1.5-2.2) ***
Lowest Mother's Ed. Quintile	2.3 (1.5-3.5) ***	2.1 (1.4-3.2) ***	2.8 (1.8-4.4) ***	2.6 (1.6-4.1) ***	2.4 (1.4-4.2) **	2.4 (1.4-4.1) **	2.7 (1.8-4.0) ***	2.6 (1.7-3.8) ***	2.3 (1.1-4.3) *	2.1 (1.1-4.3) *
Low to Mid Mother's Ed. Quintile	1.9 (1.3-2.9) **	1.8 (1.2-2.7) **	2.2 (1.4-3.5) ***	2.1 (1.3-3.3) **	2.2 (1.3-3.7) **	2.1 (1.3-3.6) **	2.3 (1.5-3.5) ***	2.2 (1.5-3.4) ***	1.5 (0.8-2.8)	1.4 (0.7-2.6)
Mid Mother's Ed. Quintile	1.6 (1.1-2.4) *	1.5 (1.0-2.3) *	2 (1.3-3.1) **	2 (1.3-3.0) **	1.8 (1.1-2.8) *	1.8 (1.1-2.8) *	2.2 (1.5-3.3) ***	2.2 (1.5-3.2) ***	1.7 (0.9-3.2)	1.6 (0.8-3.1)
Mid to High Mother's Ed. Quintile	1.1 (0.7-1.9)	1.1 (0.7-1.8)	1.3 (0.8-2.1)	1.3 (0.8-2.1)	1.6 (1.0-2.6)	1.6 (0.9-2.6)	1.4 (0.9-2.2)	1.4 (0.9-2.2)	1.3 (0.6-2.7)	1.3 (0.6-2.7)
Older Mom	0.8 (0.6-1.0) *	0.8 (0.6-0.9) *	0.7 (0.6-1.0) *	0.7 (0.6-0.9) *	0.9 (0.7-1.3)	0.9 (0.7-1.3)	0.9 (0.6-1.2)	0.9 (0.6-1.2)	0.9 (0.6-1.2)	0.9 (0.6-1.2)
Mom Not Married	1.3 (1.1-1.6) *	1.2 (1.0-1.5) *	1.1 (0.9-1.3)	1 (0.8-1.3)	1.2 (0.9-1.5)	1.2 (0.9-1.5)	1.3 (1.1-1.7) *	1.3 (1.0-1.7) *	1.2 (0.9-1.5)	1.1 (0.9-1.5)
African American	1.3 (0.9-1.7)	1.3 (1.0-1.7)	1.5 (1.1-2.1) **	1.5 (1.1-2.1) **	1.4 (1.0-2.0) *	1.4 (1.0-1.9)	1.2 (0.9-1.6)	1.2 (0.9-1.6)	0.9 (0.6-1.3)	0.9 (0.6-1.4)
Korean, Chinese, Indian or Japanese	1.3 (0.9-1.9)	1.4 (0.9-1.9)	1.3 (0.9-1.9)	1.4 (1.0-2.0)	1.7 (1.2-2.5) **	1.7 (1.2-2.5) **	1.4 (1.0-2.0)	1.4 (1.0-2.1)	1 (0.6-1.5)	1 (0.6-1.5)
Other Asian	1.4 (0.9-2.2)	1.4 (0.9-2.3)	1.9 (1.2-3.0) **	2 (1.3-3.1) **	1.9 (1.1-3.2) *	1.9 (1.1-3.1) *	1.3 (0.8-2.1)	1.3 (0.8-2.2)	0.9 (0.5-1.5)	0.9 (0.6-1.6)
Hispanic	1.1 (0.8-1.4)	1.1 (0.8-1.5)	1.2 (0.9-1.7)	1.3 (0.9-1.8)	1.4 (1.0-2.0) *	1.4 (1.0-2.0)	1.3 (1.1-1.7) *	1.4 (1.1-1.8) *	1 (0.7-1.5)	1.1 (0.8-1.6)
Native American	1.7 (0.9-3.1)	1.7 (1.0-3.0)	1.6 (1.1-2.4) *	1.6 (1.1-2.4) *	2.6 (1.2-5.4) *	2.5 (1.3-5.0) **	2.4 (1.4-4.1) ***	2.4 (1.4-4.0) ***	2.3 (1.1-5.1) *	2.3 (1.1-5.1) *
Hawaiian/Pacific Islander	0.1 (0-0.6) **	0.1 (0-0.6) **	0.3 (0.1-1.1)	0.3 (0.1-1.2)	0.3 (0.1-1.5)	0.3 (0.1-1.7)	0.2 (0-0.9) *	0.2 (0.1-0.9) *	0.1 (0-0.1) ***	0.1 (0-0.1) ***
Mixed Race	1.6 (1.1-2.4) *	1.5 (1-2.3) *	1.7 (1.0-2.7) *	1.6 (1.0-2.6) *	1.8 (1.1-2.9) *	1.7 (1.1-2.8) *	1.5 (1.0-2.2) *	1.4 (1.0-2.1)	1.8 (1.2-2.8) **	1.8 (1.2-2.8) **
Medical risk		0.9 (0.7-1.0)		1 (0.8-1.2)		0.9 (0.8-1.1)		1 (0.8-1.1)		0.9 (0.7-1.2)
Behavior risk		1.3 (1.0-1.7)		1.3 (1.0-1.7)		1 (0.7-1.3)		1.1 (0.8-1.5)		1.4 (1.0-1.9)
Obstetric Procedures		1 (0.9-1.2)		1 (0.9-1.2)		1 (0.8-1.2)		1 (0.8-1.1)		1 (0.8-1.2)
Labor Complications		1.1 (1.0-1.3)		1 (0.8-1.2)		0.9 (0.7-1.1)		1 (0.9-1.2)		1.3 (1.0-1.5) *
Very preterm		1.9 (1.1-3.3)		1.4 (0.8-2.4)		1.1 (0.7-1.9)		1.7 (1.1-2.8) *		1.2 (0.6-2.4)
Moderately preterm		1.5 (1.1-2.0) **		1.2 (0.9-1.6)		0.9 (0.6-1.3)		1.1 (0.8-1.5)		1.3 (0.8-2.0)
Very low birth weight		1.3 (0.8-2.2)		1.8 (1.2-2.9) *		2.1 (1.2-3.5) **		1.3 (0.8-2.1)		1.6 (0.8-3.1)
Moderately low birth weight		1 (0.8-1.3)		1.1 (0.8-1.4)		1.5 (1.1-1.9) **		1 (0.8-1.3)		0.9 (0.6-1.3)
Congenital anomalies		1.4 (1.0-1.9) *		1.4 (1.0-1.9) *		1.5 (1.0-2.2)		1.3 (1.0-1.8)		1.1 (0.7-1.7)

Note. N = 5,487

*
 $p < .05$

**
 $p < .01$

 $p < .001$

Morgan

Table 2

Regression Models Estimating Socio-Demographic Risk Factors for Lower Quality Parenting, without and with Statistical Controls for Gestational and Birth Risk Factors

	HOME Score ^a		Parent Support ^a	
	<i>Model 1</i>	<i>Model 2</i>	<i>Model 1</i>	<i>Model 2</i>
Intercept	11.04***	10.98***	4.00***	3.97***
Child age	0.02	0.02	0.04***	0.04***
Male	-0.10	-0.10	-0.07**	-0.07**
Lowest Mother's Ed. Quintile	-1.04***	-1.04***	-0.79***	-0.79***
Low to Mother's Ed. Quintile	-0.64***	-0.64***	-0.55***	-0.56***
Mid Mother's Ed. Quintile	-0.45***	-0.45***	-0.29***	-0.29***
Mid to High Mother's Ed. Quintile	-0.25*	-0.25*	-0.09*	-0.09*
Older Mom	0.02	0.02	0.06	0.06
Mom Not Married	-0.12	-0.13	-0.10*	-0.10**
African American	-1.34***	-1.33***	-0.34***	-0.33***
Korean, Chinese, Indian or Japanese	-1.11***	-1.11***	-0.5***	-0.5***
Other Asian	-1.47***	-1.46***	-0.49***	-0.48***
Hispanic	-0.65***	-0.64***	-0.23***	-0.22***
Native American	-0.37*	-0.37*	-0.33***	-0.33***
Hawaiian/Pacific Islander	-0.14	-0.16	0.24	0.22
Mixed Race	-0.54**	-0.53**	-0.11	-0.11
Medical risk		0.02		0.02
Behavior risk		0.02		0.02
Obstetric Procedures		0.04		0.01
Labor Complications		0.04		0.04
Very preterm		-0.08		-0.19
Moderately preterm		0.11		-0.06
Very low birth weight		-0.08		0.07
Moderately low birth weight		-0.03		0.06
Congenital anomalies		-0.09		0.03

Note. $N = 5,487$

*
 $p < .05$

**
 $p < .01$

 $p < .001$

^a Continuous variable

Table 3

Logistic Regression Models Estimating Socio-Demographic, Gestational, and Birth Risk Factors of Learning-Related Behavior Problems, with Statistical Controls for Low-Quality Parenting, at 24 Months.

	Not persistent	Not attentive	No interest	Not cooperative	Frustrated
Child age	0.9 (0.8-0.9) ***	0.9 (0.8-1.0) **	0.9 (0.8-1.1)	1 (0.9-1.0)	0.9 (0.8-1.1)
Male	1.8 (1.5-2.2) ***	1.8 (1.5-2.1) ***	1.7 (1.4-2.0) ***	1.7 (1.5-2.0) ***	1.8 (1.5-2.2) ***
Lowest Mother's Ed. Quintile	1.8 (1.2-2.7) **	2.2 (1.4-3.4) **	2 (1.1-3.4) *	2.1 (1.5-3.2) ***	1.9 (1.0-3.7)
Low to Mother's Ed. Quintile	1.7 (1.1-2.5) *	1.9 (1.2-2.9) **	1.9 (1.1-3.2) *	2 (1.3-3.0) ***	1.3 (0.7-2.4)
Mid Mother's Ed. Quintile	1.5 (1.0-2.2)	1.9 (1.2-2.9) **	1.7 (1.1-2.7) *	2.1 (1.4-3.1) ***	1.6 (0.8-3.0)
Mid to High Mother's Ed. Quintile	1.1 (0.7-1.8)	1.3 (0.8-2.1)	1.5 (0.9-2.6)	1.4 (0.9-2.2)	1.3 (0.6-2.7)
Older Mom	0.8 (0.6-1.0) *	0.7 (0.6-1.0) *	1 (0.7-1.4)	0.9 (0.6-1.2)	0.9 (0.6-1.2)
Mom Not Married	1.2 (1.0-1.5)	1 (0.8-1.3)	1.1 (0.9-1.4)	1.3 (1.0-1.6) *	1.1 (0.9-1.4)
African American	1.1 (0.8-1.5)	1.2 (0.9-1.7)	1.1 (0.8-1.6)	1 (0.7-1.3)	0.8 (0.5-1.1)
Korean, Chinese, Indian or Japanese	1.2 (0.8-1.7)	1.2 (0.8-1.7)	1.5 (1.0-2.2)	1.2 (0.8-1.8)	0.9 (0.5-1.3)
Other Asian	1.2 (0.7-1.9)	1.5 (1.0-2.5)	1.5 (0.9-2.5)	1 (0.6-1.7)	0.7 (0.4-1.3)
Hispanic	1 (0.8-1.4)	1.2 (0.8-1.6)	1.3 (0.9-1.9)	1.2 (1.0-1.6)	1 (0.7-1.5)
Native American	1.6 (0.9-3.0)	1.5 (1.0-2.3) *	2.4 (1.2-5.1) *	2.3 (1.3-3.9) **	2.3 (1.0-5.2) *
Hawaiian/Pacific Islander	0.1 (0-0.5) **	0.3 (0.1-1.1)	0.3 (0.1-1.7)	0.2 (0.1-0.9) *	0.1 (0-0.1) ***
Mixed Race	1.5 (1.0-2.2)	1.5 (0.9-2.4)	1.6 (1.0-2.7) *	1.4 (0.9-2.0)	1.7 (1.1-2.6) *
Medical risk	0.9 (0.7-1.0)	1 (0.8-1.2)	0.9 (0.8-1.1)	1 (0.8-1.1)	0.9 (0.7-1.2)
Behavior risk	1.3 (1.0-1.8)	1.3 (1.0-1.7) *	1 (0.7-1.4)	1.2 (0.9-1.6)	1.4 (1.0-2.0) *
Obstetric Procedures	1.1 (0.9-1.2)	1 (0.9-1.2)	1 (0.8-1.2)	1 (0.9-1.1)	1 (0.8-1.2)
Labor Complications	1.1 (1.0-1.3)	1 (0.8-1.2)	0.9 (0.7-1.1)	1.1 (0.9-1.2)	1.3 (1.1-1.6) *
Very preterm	1.9 (1.1-3.3) *	1.4 (0.8-2.4)	1.1 (0.7-1.9)	1.7 (1.1-2.9) *	1.2 (0.6-2.5)
Moderately preterm	1.5 (1.2-2.0) **	1.3 (0.9-1.7)	1 (0.6-1.4)	1.1 (0.8-1.6)	1.3 (0.9-2.1)
Very low birth weight	1.3 (0.8-2.1)	1.8 (1.1-2.9) *	2.1 (1.2-3.5) **	1.3 (0.8-2.1)	1.5 (0.8-3.1)
Moderately low birth weight	1 (0.8-1.3)	1.1 (0.8-1.4)	1.5 (1.2-2.0) **	1 (0.8-1.3)	0.9 (0.6-1.3)
Congenital anomalies	1.4 (1.0-2.0) *	1.4 (1.0-2.0) *	1.5 (1.0-2.3) *	1.4 (1.0-1.9)	1.1 (0.7-1.7)
Low HOME score	1.7 (1.4-2.1) ***	2.1 (1.6-2.8) ***	1.7 (1.3-2.3) ***	1.9 (1.5-2.4) ***	2.3 (1.7-3.2) ***
Low parent support	1.9 (1.4-2.5) ***	1.8 (1.4-2.4) ***	2.1 (1.6-2.7) ***	1.9 (1.5-2.5) ***	1.1 (0.8-1.5)

Note. $N = 5,487$

* $p < .05$

** $p < .01$

*** $p < .001$

Table 4

Logistic Regression Models Estimating Socio-Demographic, Gestational, Birth, and Parenting Risk Factors of Falling Into the Highest 10% (11.3%) on Consistent Learning-Related Behaviors Problem Scale at 24 Months.

	Learning-Related Behavior Problems at 24 Months		
	Model 1	Model 2	Model 3
Child age	0.9 (0.8-1.0)	0.9 (0.8-1.0)	0.9 (0.8-1.1)
Male	1.7 (1.4-2.1) ***	1.7 (1.4-2.1) ***	1.7 (1.4-2.1) ***
Lowest Mom's Ed. Quintile	3.0 (1.7-5.5) ***	3.0 (1.6-5.3) ***	2.4 (1.3-4.4) **
Low to Mid Mom's Ed. Quintile	2.4 (1.4-4.3) **	2.4 (1.4-4.2) **	2.1 (1.2-3.6) *
Mid Mom's Ed. Quintile	2.0 (1.2-3.5) *	2.0 (1.2-3.5) *	1.9 (1.1-3.3) *
Mid to High Mom's Ed. Quintile	1.6 (0.8-3.0)	1.6 (0.8-2.9)	1.5 (0.8-2.9)
Older Mom	0.9 (0.6-1.2)	0.9 (0.6-1.2)	0.9 (0.6-1.3)
Mom Not Married	1.2 (0.9-1.5)	1.2 (0.9-1.5)	1.1 (0.9-1.5)
African American	1.5 (1.1-2.0) *	1.4 (1.0-1.9) *	1.1 (0.8-1.5)
Korean, Chinese, Indian or Japanese	1.4 (0.9-2.2)	1.4 (0.9-2.2)	1.1 (0.7-1.8)
Other Asian	1.7 (0.9-2.2)	1.6 (0.9-3.0)	1.2 (0.7-2.3)
Hispanic	1.2 (0.8-1.6)	1.1 (0.8-1.6)	1.0 (0.7-1.4)
Native American	2.8 (1.2-6.4) *	2.7 (1.2-6.1) *	2.6 (1.1-6.2) *
Hawaiian/Pacific Islander	0.2 (0.0-1.6)	0.2 (0.0-1.6)	0.2 (0.0-1.5)
Mixed Race	2.2 (1.4-3.5) ***	2.2 (1.3-3.4) **	2.0 (1.2-3.2) **
Medical risk		1.0 (0.9-1.2)	1.0 (0.8-1.3)
Behavior risk		0.9 (0.6-1.4)	1.0 (0.7-1.5)
Obstetric Procedures		1.0 (0.8-1.2)	1.0 (0.8-1.2)
Labor Complications		0.9 (0.8-1.1)	1.0 (0.8-1.1)
Very preterm		1.2 (0.7-2.2)	1.2 (0.7-2.2)
Moderately preterm		1.1 (0.8-1.7)	1.2 (0.8-1.8)
Very low birth weight		1.8 (1.0-3.2) *	1.8 (1.0-3.2) *
Moderately low birth weight		1.2 (0.9-1.6)	1.2 (0.9-1.6)
Congenital anomalies		1.3 (0.8-1.9)	1.3 (0.8-2.1)
Low HOME score			2.1 (1.5-2.8) ***
Low Parent Support			2.1 (1.6-2.9) ***

Note. N = 5,487

*
p<.05

**
p<.01

p<.001