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Differential effects of parenting in preterm and full-term children on developmental outcomes

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ABSTRACT

Objective: To examine the relations between preterm birth, parenting behavior during early childhood, cognitive development, and social–emotional outcomes at Kindergarten entry, and to determine whether parenting behavior differentially influences this developing system in children born preterm compared to children born full-term.

Methods: The nationally representative sample comprised 3600 full-term and 1300 preterm children born in the US in the year 2001. All children who entered Kindergarten and who participated in data collection at 9 months, 24 months, and Kindergarten entry were included in the study. Measures of parenting behavior were collected at 9 and 24 months and cognitive development at 24 months via home visits. Social–emotional outcomes were assessed at Kindergarten entry via parent and teacher report. Multiple-sample Structural Equation Modeling was used to analyze group differences in a model whereby early childhood parenting behavior predicted cognitive outcomes, and social–emotional outcomes at Kindergarten entry, and indirectly predicted social–emotional outcomes via early cognitive processes.

Results: The full sample developmental model indicated excellent fit to the data. Preterm birth status indirectly influenced social–emotional outcomes at Kindergarten entry via its effect on early childhood parenting behavior and cognitive development. The multi-sample model revealed significant differences in the way in which early parenting behavior exerted its influence on outcomes at Kindergarten entry in preterm children compared to full-term children.

Conclusions: For preterm children, parenting indirectly influenced social–emotional outcomes via early cognitive functioning. Findings highlight the importance of early identification and targeted parenting programs to support early cognitive development in preterm children.

1. Introduction

Improved survival of preterm birth has contributed to an increased interest surrounding the developmental sequelae of children born early. Infants who escape severe neurological impairment are more likely to experience subtle late effects, which are typically detected later in life and adversely affect academic and psychological functioning [1–4]. These subtle late effects have received increased attention recently, and have been found to persist into adolescence [5–7] and into adulthood [8]. They span social, academic, and cognitive domains, and place a significant toll on economic, health care, education, and mental health systems [1].

Impairments in cognitive functioning have been well documented in late preterm [9], very preterm [2], and extremely preterm children [10] and differences in motor, cognitive, and attentional functioning have been identified as early as toddlerhood [11–14]. Similarly, children who are born preterm are at an increased risk for developing externalizing behavioral difficulties (e.g. hyperactivity, aggression), social, and peer relationship problems, and they are more likely to be diagnosed with Attention-deficit/hyperactivity disorder (ADHD) compared to same-age full-term peers [2,15,16]. Although preterm related impairments may not reach the attention of parents and teachers until later in development, research on the neuropathology of preterm birth suggests that these challenges likely have their roots in infancy.

Early maturational delays in cognitive processes are thought to underlie and disrupt the subsequent acquisition of social, emotional, and behavior processes seen in elementary school and beyond [11,13,15,17], thus attention to early development in this vulnerable group may offer insight into how best to influence subsequent development. Specifically, the early childhood years provide an important point of intervention because the neural systems underlying social, emotional, and cognitive development undergo rapid reorganization and are especially susceptible to environmental influences [18]. Identifying environmental factors, such as parenting behavior, that are amenable to change and can

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promote optimal growth trajectories in this high-risk population has become increasingly important.

Researchers have repeatedly demonstrated that warm, sensitive, and responsive caregiving along with age-appropriate cognitive stimulation facilitates growth in social–emotional and cognitive domains in typically developing children [19–22]. Mother–child interactions during infancy have long lasting effects on development and have been found to be associated with outcomes in Kindergarten. Specially, maternal positive regard for the child, responsive interaction and language/cognitive stimulation have been linked to optimal cognitive and social–emotional development during early childhood [22] and during school entry [20,21]. Such interactions have been found to be particularly critical during the early years, as this is a period of rapid cognitive and social–emotional growth and brain organization [18]. Thus, high-quality parenting during the earliest stages of development, which is most susceptible to internal and external influences on cognitive and social–emotional trajectories, has the potential to mitigate risk factors associated with preterm birth. However, whether early parenting behavior operates similarly for children who are biologically at-risk for adverse outcomes is not as well established [23].

The current study tested a hypothesized developmental model (Fig. 1) that proposed paths from birth status (preterm/full-term) directly to social–emotional outcomes at Kindergarten entry and indirectly via early cognitive processes and parenting behavior during early childhood. Parenting behavior was also hypothesized to directly influence cognitive development and social–emotional outcomes. Using gestational age criteria, the current study also evaluated whether early childhood parenting behavior differentially predicted outcomes in preterm children compared to full-term children. Utilizing a large, nationally representative sample of children born preterm, this study addressed previous methodological flaws in extant literature from which sufficient samples, comparison groups [2], and longitudinal models were missing [13].

2. Method

2.1. Study design

We analyzed data from the Early Childhood Longitudinal Study-Birth Cohort (ECLS-B), sponsored by the US Department of Education's National Center for Education Statistics (NCES) in the Institute of Education Sciences. The ECLS-B followed a nationally representative sample of children born in 2001 from birth through Kindergarten entry, ending in 2007, and over-sampled low birth weight and preterm infants, specific racial/ethnic groups, and twins [24]. Multi-informant and multi-method data collection allowed for an in-depth description of neonatal health status, physical, cognitive, social–emotional, and psychomotor development from birth to Kindergarten, across home and educational settings. Children who were born to mothers under 15 years, who died, or were adopted prior to 9 months, were ineligible for participation. Measurement time points are referred to by the approximate chronological birth related age in which measures were collected (e.g. birth, 9 months, 24 months, and Kindergarten entry). All unweighted sample sizes are rounded to the nearest 50.

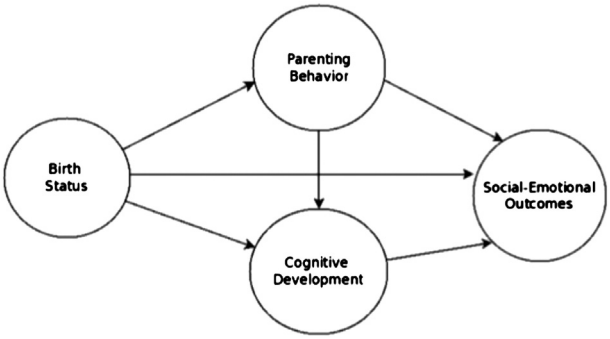

Fig. 1. Conceptual model.

2.2. Participants

Our study used ECLS-B data comprising four time points from 5050 children born in 2001. Birth data (from birth certificates), and behavioral/interview data at 9months, 24months, and Kindergarten provide a longitudinal design. Inclusion criteria required children to be enrolled in Kindergarten for the first time in 2006 or 2007. Children with Down Syndrome ($n = 50$) were excluded. Fifty-one percent were male (see Tables 1 and 2 for child demographic information). The majority of primary caregivers at all time points were biological mothers ($n = 5000$; range 96–99%), and approximately 900 mothers (18%) had less than a high school diploma at the time of the child's birth, 1500 (29%) mothers had received a high school diploma or equivalent, 1150 (22%) had some college, and 1500 (29%) reported having a bachelor's degree or higher.

2.2.1. Missing data

Longitudinal research studies often have large amounts of missing data across the course of the entire study [25], most especially on the outcome variables. To understand the nature of the missing data, a series of comparisons were conducted on the included sample and excluded sample on demographic and predictor variables (statistical comparisons between included and excluded samples are available from the first author upon request). No significant differences were found between the two groups on clinical gestation, gender, birth weight, motor scale score, and parental intrusiveness. The differences that were significant were not of clinical importance. For example, the included sample obtained a mean score of 125.93 compared to 125.10 for the excluded sample, representing minimal differences between the two groups on mental development index. Rather than imputing a large amount of missing data, sample weights were applied to all analyses, consistent with the recommendation of the National Center for Educational Statistics (NCES). This method accounted for non-response biases and allowed for the generalization of results. The final sample used in the longitudinal model consisted of approximately 5050 children.

2.3. Measures

In the initial developmental model, Birth Status was measured as a latent variable that included both gestational age and birth weight from birth certificate data. For the multi-group analyses, gestational age was dichotomized to preterm (≤36 weeks) or full-term (≥37 weeks) and birth weight was added as a covariate. Approximately 1300 children were born preterm and 3600 children were in the full-term group.

2.3.1. Parenting behavior

Parenting behavior was measured using observed indicators of positive and negative parenting from two play-based parent–child

Table 1
Overview of data collection for full sample.

Data collection wave	Age of study		Child data collection
	Mean	*SD*	
9months	10.4 months	*SD* = 1.8	F2001–F2002
24months	24.4 months	*SD* = 1.2	F2003–F2004
Kindergarten 2006	65.1 months	*SD* = 3.8	F2006–S2007
Kindergarten 2007	74.4 months	*SD* = 2.8	F2007–S2008

Note. F = Fall; S = Spring.