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Effects of preterm birth and gender on temperament and behavior in children

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ABSTRACT

The aim of the present study was to assess the direct and interactive effects of premature birth and gender on temperament and behavioral problems in 80 children aged 18–36 months. The sample was composed of children born preterm (PT; $n = 44$) and children born full-term (FT; $n = 36$). The children's mothers completed temperament (ECBQ) and behavioral problem (CBCL 1.5–5) assessments. Analyses of variance (ANOVA 2×2) were performed. With regard to temperament, PT children exhibited significantly higher scores on high-intensity pleasure and perceptual sensitivity and lower scores on discomfort, cuddliness, and Attentional Focusing compared with FT children. Girls scored higher on fear and discomfort compared with boys. With concern to behavioral problems, PT children scored higher on attention problems compared with FT children. No interactive effect of premature birth and gender on temperament or behavioral problems was found.

1. Introduction

The survival of preterm neonates has been increasing over the last several years as a consequence of enormous progress in perinatal care. Despite this considerable advance, preterm births are still a large problem, and children born preterm continue to represent a high-risk population for behavioral problems (Arpi & Ferrari, 2013; Aylward, 2002). Neonatal intensive care units (NICUs) protect the health and development of preterm neonates (Montirosso, Del Prete, Bellù, Tronick, & Borgatti, 2012), but this is a distressful environment that includes painful, invasive, and uncomfortable experiences for preterm infants (Anand & Scalzo, 2000). Immature neonates depend on their special caregiving context to survive and regulate their biobehavioral systems.

Early distressful experiences can have a negative impact on human development (Shonkoff, Richter, van der Gaag, & Bhutta, 2012). In the developmental pathway of premature infants, children born preterm are more likely to have motor development problems (Burns, O'Callaghan, McDonell, & Rogers, 2004; de Kleine et al., 2003), low cognitive levels (Neubauer, Voss, & Kattner, 2008; Wolke, Samara, Bracewell, & Marlow, 2008; Woodward et al., 2009), poor school performance (Wolke et al., 2008), and emotional and behavioral problems (de Kleine et al., 2003; Gray, Indurkhya, & McCormick, 2004; Woodward et al., 2009).

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Very low birth-weight preterm children exhibit a higher prevalence of behavioral problems within the clinical range compared with the overall population. They also have more externalizing problems, particularly those that involve attention (Reijneveld et al., 2006). A meta-analysis was performed to estimate the effect of preterm birth on school-aged children's cognition and behavior and found that children born preterm exhibited increases in externalizing and internalizing problems in 81% of the studies and a higher prevalence (up to 20%) of attention-deficit/hyperactivity disorder compared with the control group (Bhutta, Cleves, Casey, Cradock, & Anand, 2002). A higher severity of prematurity (i.e., very preterm and extremely preterm) is associated with a higher prevalence of cognitive and emotional/behavioral problems during child development (Reijneveld et al., 2006; Woodward et al., 2009).

Physiological, emotional, attentional, and behavioral developmental regulation processes in children born preterm are negatively affected, especially with regard to attentional regulation at preschool age (Feldman, 2009). Therefore, problems in these integrative and hierarchical self-regulation processes from birth to preschool age contribute to developmental problems during childhood that affect later development at school age (Berger, 2011). The risk factors for later behavioral problems include dispositional temperament traits during early development (Calkins, 2009).

Temperament presents strong relationships between biological mechanisms and behavioral profiles, revealing individual differences around which the personality of a child develops (Gunnar, 2003; Rothbart, 2011; Rothbart & Posner, 2005). Temperament interacts with experiences, resulting in relatively stable behavioral features during development (Bates, Goodnight, Fite, & Staples, 2009; Rothbart & Bates, 1998). Temperament is defined as constitutionally based individual differences in reactivity and self-regulation that appear early in life and are influenced over time by heredity, maturation, and experience (Rothbart & Bates, 1998; Rothbart & Derryberry, 1981; Rothbart & Putnam, 2002; Rueda, Posner, & Rothbart, 2004). *Constitution* is biologically based, with the individual's relatively enduring biological make-up influenced over time by genes, maturation, and the environment. *Reactivity* refers to the latency, intensity, and duration of emotional, motor, and orienting reactions. *Self-regulation* processes modulate reactivity. The development of self-regulation processes is reached at preschool age and contributes to successful learning at school age (Berger, 2011). Temperament includes three main factors: Negative Affectivity, Surgency, and Effortful Control (Rothbart, 2011).

Few studies have examined temperament in children born preterm, assessed using Rothbart's approach. Temperament in children born preterm and aged 5–11 years presented a lower ability to maintain attention compared with children with normal development and children with Down syndrome (Nygaard, Smith, & Torgersen, 2002). Interestingly, a biobehavioral reactivity-recovery mechanism was noted in the developmental regulatory process in children born preterm (Klein, Gaspardo, Martinez, Grunau, & Linhares 2009). In early neonates, greater biobehavioral reactivity (e.g., pain response, heart rate, and sleep-wake state) to the painful stimulus of puncture for blood sampling in the NICU was predictive of later higher Negative Affectivity and impulsivity in child temperament at 18–36 months of age. Poorer biobehavioral recovery after the puncture event was also predictive of Extraversion at the same age (Klein et al., 2009a,b). In addition to these findings, the relationship between the early cumulative number of pain-related and distress-related medical and care procedures during the NICU stay and later temperament with Negative Affectivity depended on the level of parental stress at the end of the children's first year of age (Voigt et al., 2013). Lower parental stress can buffer the negative influence of neonatal distress in preterm infants. High maternal stress was associated with low regulatory competence in preterm infants at 6 months of age (Olafsen et al., 2008). Altogether, preterm birth, neonatal pain, early distress experiences, and parental stress variables have mediator-moderator influences on child development outcomes.

To better understand temperament in child development, gender must also be considered. A meta-analysis of temperament and gender in children showed that girls outperformed boys in Effortful Control, but boys were slightly more active, were less shy, and derived more pleasure from high-intensity stimuli than girls (Surgency factor) (Else-Quest, Hyde, Goldsmith, & Van Hulle, 2006). Effortful Control is relevant for emotional and behavioral regulation, including focusing attention, inhibitory control, perceptual sensitivity, and low-intensity pleasure (Rueda, Posner, & Rothbart, 2005). Girls also had temperament with higher Effortful Control than boys in samples of children with biological (i.e., low birth weight, preterm) and psychosocial (i.e., low-income families) risks (Cosentino-Rocha & Linhares, 2013).

To our knowledge, few studies have examined the effect of gender on temperament in children born preterm (see Cosentino-Rocha & Linhares, 2013). Although preterm infants with temperamental low regulatory competence presented higher response rates to joint attention than preterm control infants, both preterm and full-term girls outperformed boys in joint attention at 12 months of age (Olafsen et al., 2006). Preterm boys at 6 months of age and preterm girls at 12 months of age presented shorter periods of attentional orientation (Effortful Control factor) compared with their full-term peers. In contrast, preterm girls at 6 months of age showed longer periods of attentional orientation than full-term girls of the same age (Kerestes, 2005). Preterm boys exhibited higher anger (Negative Affectivity factor) and high-intensity pleasure (Extraversion factor) than preterm girls. Preterm girls presented higher attentional focusing (Effortful Control factor) than preterm boys at 5 years of age (Nygaard et al., 2002).

Moreover, few studies have examined the interactive effect of preterm birth and gender on child temperament and behavioral problems at preschool age. Therefore, the aim of the present study was to investigate the direct and interactive effects of premature birth and gender on temperament and behavioral problems in children aged 18–36 months. The two hypotheses tested in the present study were the following: (1) there are differences between children born preterm and children born full-term with regard to temperament and behavioral problems (i.e., a direct effect of premature birth), and (2) there is an interactive effect of preterm birth and gender on children's temperament and behavioral problems.

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