



Differential associations between maternal scaffolding and toddler emotion regulation in toddlers born preterm and full term[☆]

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ABSTRACT

Background: Parental “scaffolding” behavior has been associated with developmental outcomes in at-risk children. **Aims:** Because there are limited empirical data regarding how scaffolding is associated with emotion-based developmental skills, the purpose of this study was to compare associations between maternal verbal scaffolding and toddler emotion regulation, including fewer displays of negative affect and increased contentment and enjoyment during play, in toddlers born preterm and full term.

Study design: This study was a cross-sectional cohort design. Maternal and toddler behavior was assessed during 5 min of videotaped free play with standardized toys.

Subjects: 131 toddlers (18–22 months) and their mothers were included (77 born preterm; 54 born full term).

Outcome measures: Toddler emotion regulation, negative affect, and dyadic mutual enjoyment were coded from videotaped play.

Results: The association between maternal scaffolding and emotion regulation was different for dyads with a toddler born preterm versus full term, wherein the association was positive for toddlers born preterm and non-significant for toddlers born full term. Similarly, the association between maternal scaffolding and negative affect was different for the two groups: negative for toddlers born preterm and non-significant for toddlers born full term. Finally, the association between maternal scaffolding and mutual enjoyment was positive for toddlers born preterm and non-significant for toddlers born full term.

Conclusions: Our findings highlight early differences in mother-child interactive style correlates of children born preterm compared to those born full term. Maternal scaffolding behavior may be uniquely associated with emotion regulation and a positive dyadic encounter for toddlers born preterm.

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1. Introduction

Children born preterm are at greater risk for developmental delays, including difficulties with cognitive function, self-regulation, attention, executive function, and emotion regulation [1–3]. Because outcomes are highly variable in this population, increasing our understanding of factors associated with developmental outcome variability may be

instrumental in elucidating risk and resilience factors as well as in developing interventions to optimize outcomes in this population [4,5].

Given the range of potential developmental outcomes, intervention research for children born preterm has included the impact of parent behaviors on child development [6]. Parental scaffolding is one such behavior that has been shown to influence outcomes in at-risk children [7]. According to the sociocultural theory of development [8], scaffolding entails cognitive support processes that enable children to accomplish goals that otherwise exceed their ability. As parents model, support, and encourage the development of new skills through scaffolding, children gain autonomy and become better able to solve problems independently. Responsive parenting, which includes scaffolding, has been related to positive cognitive, social, language and reading outcomes in children born preterm [6–8].

Verbal scaffolding, which helps children solve problems and understand conceptual links between objects and/or activities through verbal prompts provided by their parent, has been the focus of recent research highlighting the importance of parents' verbal input for children's learning [9]. In both preterm and full term populations, more sensitive

Abbreviations: VLBW, very low birth weight; BSID-II, Bayley Scales of Infant Development 2nd edition; BSID-III, Bayley Scales of Infant Development 3rd edition; MDI, Mental Developmental Index; LBW, low birth weight; C-CARES, Caregiver-Child Affect, Responsiveness, and Engagement Scale.

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parental support and higher levels of verbal scaffolding during early childhood have been shown to predict better language [7,10], nonverbal problem-solving [7], reading [10], cognitive [11], social development [11], and executive functioning skills [7] once children are in school. Despite the demonstrated link between maternal scaffolding in preterm and full term children's cognitive development [7,11–13], limited empirical data are available regarding how scaffolding is associated with emotion based developmental skills. Emotion regulation, the ability to modulate one's emotional state and response to change and environmental context, is one emotion-based developmental skill conceptualized to be fundamental for learning [14]. Emotion regulation involves the coordinated and dynamic interplay between both negative and positive emotional states, which may promote effective coping [14]. Thus, the overarching construct of emotion regulation includes limited frequency, duration, and intensity of negative affect and greater enjoyment, contentment, and engagement in activities [14].

Because verbal scaffolding maintains a child's focused attention and provides contingent responding and rich language stimulation, it is conceptualized to support emotion regulation [15], as attention and engagement are hypothesized to be incompatible with negative affect, emotional distress and emotion dysregulation [16,17]. More broadly, supporting a child's focused attention with language and affective-emotional support is hypothesized to facilitate the development of cognitive and social skills [9]. Engaging in appropriate and mutually regulatory exchanges with their parents may promote the development of self-regulation in full term infants [18] and has been shown to be related to lower negative affect in preterm children [19]. Among preschoolers born preterm, impairments in self-regulation were predicted by less sensitive parenting styles [20]. In this way, emotion regulation, including fewer displays of negative affect and increased contentment and enjoyment during play with parents, may be mediated in part by parent-child interactions that involve scaffolding.

The purpose of the current study was to examine and compare maternal verbal scaffolding correlates in toddlers born preterm and full term. Specifically, we investigated the associations between maternal verbal scaffolding and toddler emotion regulation, negative affect, and dyadic mutual enjoyment.

2. Methods

2.1. Subjects

The study included toddlers between the ages of 18 and 22 months and their mothers. Toddlers were assessed between 2005 and 2008. Toddlers born preterm were recruited from the developmental follow-up clinic for the University of New Mexico's Newborn Intensive Care Unit. The full term sample was recruited through the University of New Mexico's Pediatric Clinic. Seventy-seven toddlers born preterm (birth weights of less than 1250 g and/or born at less than 32 weeks gestation) and fifty-four toddlers born full term participated. Age at testing was adjusted for gestational age for the preterm group. Toddlers were excluded from the study if they had been prenatally exposed to drugs, were visually/hearing impaired, had a known genetic abnormality, constituted a multiple birth, and/or did not reside with their biological families. Table 1 provides further demographic information.

2.2. Measures

2.2.1. The Bayley Scales of Infant and Toddler Development-Cognitive Score [21,22]

The Bayley Scales of Infant Development-II (BSID-II) Mental Developmental Index (MDI) [21] and the Bayley Scales of Infant and Toddler Development-III (BSID-III) Cognitive Score [22] were used to assess cognitive function. The BSID-III was used for children assessed after 2007 (37 participants). To have a comparable cognitive

Table 1
Demographic characteristics of preterm and full term groups.

Factor	Preterm n = 77	Full Term n = 54
	Mean (SD)	Mean (SD)
Test age (months)***	20.12 (1.25)	19.26 (1.49)
Birth weight (grams)****	937.70 (229.0)	3365.70 (486.3)
Maternal age (years)	29.64 (6.85)	27.35 (6.22)
♦Maternal education	1.78 (1.54)	1.63 (1.76)
□Household income	1.97 (1.93)	2.09 (2.26)
ΔBSID-III cognitive Score****	97.56 (10.0)	105.80 (6.75)
»Verbal Scaffolding Scale**	4.01 (3.04)	5.67 (3.48)
+Toddler negative affect**	1.34 (0.55)	1.11 (0.30)
+Toddler emotion regulation****	4.42 (0.84)	4.88 (0.29)
+Dyadic mutual enjoyment****	2.79 (1.07)	3.56 (0.87)
<i>Gender</i>		
Male	50.65%	61.11%
	Frequency (%)	Frequency (%)
<i>Child ethnicity</i>		
White	20 (27%)	13 (24%)
Native American	18 (24%)	6 (11%)
Hispanic/Latino	33 (45%)	33 (61%)
Other	3 (4%)	2 (4%)

Note:

♦ 0 - <H.S., 1 - H.S. graduate; 2 - HS + 1 yr college; 3 - Associate degree; 4 - Bachelor degree; 5 - Some graduate school, 6 - Masters degree and higher.

□ 0 - < \$10,000; 2 - \$10,000 - \$20,000; 3 - \$20,000 - \$30,000; 4 0 - \$30,000 - \$40,000; 5 - \$40,000 - \$50,000; 6 - \$60,000 - \$70,000; 7 - \$70,000 +.

+ Subscales from the Caregiver-Child Affect, Responsiveness, and Engagement Scale (C-CARES; [26]).

Δ The BSID-III Cognitive score was calculated as a measure of cognition for all participants [21,22].

» Verbal scaffolding scale [7].

** p < 0.01.

*** p < 0.001.

**** p < 0.0001.

measure for both groups, we transformed the BSID-II MDI to a BSID-III Cognitive Score based on a conversion formula that has been detailed in a prior publication [23]. Thus, the BSID-III Cognitive Score was used as a measure of cognition for all participants. It has a mean of 100 and a standard deviation of 15.

2.2.2. Verbal Scaffolding Scale [7]

Child and mother dyads were videotaped for 10 min with a standard set of toys. The first five minutes (where both mother and child were visible and codable) of the videotaped mother-child interaction was used for coding purposes. Verbal scaffolding, using the Verbal Scaffolding Manual [23,24], was based on the content of the mothers' verbal communication to the child. Maternal statements constituted scaffolding statements if they were intended to help the child make associations or provided strategies to help the child solve a problem. Simple scaffolding included statements whereby the mother labeled her action or the child's action. Complex scaffolding included: statements that involve associating an object with a specific location; using 'like that' comparisons; describing objects (e.g., apples are red); defining the uniqueness, features, or function of an object; defining cause and effect emotions, senses, contrasts, or categories of objects; and linking nouns with nouns. The total simple and complex scaffolding scores were utilized as the (combined) scaffolding score for this study. Tapes were coded by three coders (last author and two graduate students) who maintained 90% inter-rater reliability. Each tape was coded by two coders who obtained consensus, and a third coder independently coded every tenth tape.

2.2.3. Caregiver-Child Affect, Responsiveness, and Engagement Scale (C-CARES) [25]

The C-CARES coding system [25] is based on caregiver-child engagement during 10 min of videotaped free play. The C-CARES evaluates the

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