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Maternal Depression and Expressive Communication in One-Year-Old Infants

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Abstract

To separate effects of maternal depression on infant cognitive versus language development, 1-year-olds were assessed using the revised Bayley Scales of Infant and Toddler Development (BSID-III). Percentile scores on the Bayley Expressive Communication (*EC*) subscale were significantly negatively correlated with maternal self-report scores on the Beck Depression Inventory (BDI-II). However, mothers' BDI-II scores did not correlate with infant percentile scores on the general cognitive (*COG*) or receptive communication (*RC*) subscales. Boys had significantly lower percentile scores than girls on the *RC* and *EC* scales, but did not differ on the *Cog* scale. Gender and maternal depression did not significantly interact on any of the scales. These findings suggest problems with expressive communication precede, and may at least partially account for, apparent deficits in general cognitive development.

Keywords

Bayley scales; maternal depression; cognitive development; expressive communication

1. Introduction

Maternal depression in the postpartum period, either by itself or in conjunction with other factors such as child gender, the presence of contextual risk, or the chronicity and timing of the mother's depression, has been linked to multiple effects on child cognitive and linguistic development (Coghill, Caplan, Alexandra, Robson, & Kumar, 1986; Feldman & Eidelman, 2009; Grace, Evindar, & Stewart, 2003; Hay & Kumar, 1995; Kurstjens & Wolke, 2001; Murray, Kempton, Woolgar, & Hooper, 1993; NICHD Early Child Care Research Network, 1999; Petterson & Albers, 2001; Sohr-Preston & Scaramella, 2006; Sutter-Dallay et al., 2011; Whiffen & Gotlib, 1989. These effects have been most often attributed to disruptions in depressed caregivers' ability to support or "scaffold" infant state and behavior, with resulting deficits in infants' extraction of information about environmental contingencies

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(e.g., Hay, 1997). However, beyond effects on general cognitive processes, recent research has suggested that parents scaffold pre-linguistic infants' speech perception and rudimentary language development to an extent not previously recognized (Kuhl, 2007). If so, then in cases in which such scaffolding is likely disrupted – as in postpartum depression (Bettes, 1988) -- early effects on infant communicative development, separate from effects on general cognitive development, may be observable. In fact, because in some earlier assessments measures of cognitive development were heavily dependent on infant communicative skills, effects that have been attributable to delays in cognitive development may instead be partly or wholly attributable to delays in language development. The purpose of the present paper is to report such findings.

The evidence for effects of maternal depression on infant communicative development comes both from laboratory-based studies on pre-linguistic infants and outcome studies focused on infancy, the toddler years, and beyond. Caregivers support infant communicative development in a number of ways, including through the quantity and quality of vocal stimulation they provide, along with the extent to which it is contingent on infant behavior (Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991; Rollins, 2003). For example, a child's developing vocabulary is predicted to some extent by the amount and complexity of language stimulation the mother gives (Gleitman, Newport, & Gleitman, 1984; Hart & Risley, 1995; Huttenlocher et al., 1991). In addition, when addressing infants, parents tend to exaggerate changes in vocal pitch, hyperarticulate vowels, and produce slowed, simplified, and repetitive utterances (Fernald, 1984). Evidence indicates that this infant-directed speech (IDS) is especially effective at promoting important foundational processes for pre-linguistic infants, including phoneme discrimination (Liu, Kuhl, & Tsao, 2003), word segmentation (Thiessen, Hill, & Saffran, 2005), word learning and memory (Ma et al., 2011; Singh, Nestor, Parikh, & Yull, 2009), and the detection of phrase boundaries (Jusczyk et al., 1992). Consistent with the hypothesis that IDS highlights key aspects of linguistic stimuli for the infant, mothers of 1-year-old infants who produce IDS with relatively greater pitch modulation also report their children have higher concurrent productive vocabulary (Porritt et al., 2014). More broadly, recent evidence suggests that the volume of infant-directed speech in the home environment has an effect on the efficiency of child language processing, with resulting effects on the rate of language growth (Weisleder & Fernald, 2013).

However, depressed mothers exhibit differences relative to non-depressed mothers in the pitch characteristics, linguistic content, degree of contingent delivery, and degree of infant focus in their speech (Bettes, 1988; Breznitz & Sherman, 1987; Herrera et al., 2004; Murray et al., 1993; Porritt et al., 2014; Reissland, Shepherd & Herrera, 2003; Zlochower & Cohn, 1996). Thus, there are clear deficits in the kinds of maternal behavior thought to promote rudimentary language development, and these may be a root cause of later delays in vocabulary development.

Consistent with the language-promoting effects of infant-directed speech, some evidence suggests a delay in the "perceptual commitment" to the parents' native language for infants of depressed mothers. Whereas infants typically exhibit the ability to discriminate non-native phonemes at 6 months, but lose this ability toward the end of the first year as they

commit to their native language (Werker & Lalonde, 1988), infants of depressed mothers showed poor discrimination of non-native phonemes at 6 months, but better-than-normal discrimination of non-native phonemes at 10 months (Weikum, Oberlander, Hensch, & Werker, 2012). Direct links have been established between native speech sound discrimination and later word learning (Tsao, Liu, & Kuhl, 2004; Werker & Yeung, 2005). Interestingly, infants of mothers who had taken selective serotonin reuptake inhibitors (SSRIs) during gestation showed an opposite effect: faster commitment to the native language, possibly attributable to neurochemical acceleration of brain development (Weikum et al., 2012)

Taken together, this research suggests that delays in language development may start very early in the lives of infants of depressed mothers, and highlights some potential behavioral mechanisms. Although not specifically tied to the ways in which mothers talk to their infants, delays in language development have been observed in several large-scale outcome studies with children of depressed mothers. For example, the NICHD Early Research Network study (1999) followed a large sample of mothers and infants at 6, 15, 24, and 36 months, and assessed general cognitive and language development at 36 months. After demographic risk factors had been taken into account, relative to infants whose mothers had no epochs with elevated self-report scores of depression, children of mothers with chronically or occasionally elevated depression scores not only performed more poorly on an assessment of “school readiness” -- which included items on color recognition, letter identification, number/counting skills, comparisons, and shape recognition – but also on a measure of verbal comprehension and expressive language. Expressive language scores were lower for children of mothers with chronically elevated than occasionally elevated scores. Possibly related to maternal scaffolding of infant language development as outlined above, these differences were mediated by ratings of maternal sensitivity coded from separate play sessions averaged across the 4 multiple assessment ages.

Similar outcomes were reported by Stein et al. (2008), who performed a longitudinal study on the effects of maternal depression on child language development at 36 months, with an explicit focus on the roles of parenting and socio-demographic risk factors. Structural equation modeling suggested that maternal depressive symptomology had an indirect effect on language development, and that the pathway was through the negative effects of depression on the quality of the mother’s early observed caregiving. The negative effect of elevated maternal depressive symptoms on caregiving was stronger for socioeconomically more disadvantaged families, but there was no moderating effect of SES on the path between caregiving and language.

Several smaller studies have yielded similar conclusions. For instance, Milgrom, Westley, and Gemmill (2004) reported that 42-month-old children of mothers who had been treated as inpatients for major depression in the perinatal period had significantly lower full-scale WPPSI-R scores (but not Verbal IQ) and significantly lower cognitive and language scores on the Early Screening Profile relative to controls. The outcomes on cognitive-linguistic development were mediated by observation-based assessments of maternal responsiveness obtained at 6 months postpartum, after the mothers’ acute depressive episodes had remitted.

These studies are consistent with the hypothesis that depression leads to deficits in the quality of maternal parenting behavior, which in turn contributes to poorer language development, possibly via general effects of enrichment on cognitive development, but also possibly due to specific effects on the quantity and/or quality of maternal vocal input. Given the evidence for very early effects of maternal stimulation of rudimentary language processing, an important question in how early during development the effects of maternal depression on infant language development can be detected. However, very little data exists on this point (Azak, 2012). Cornish et al. (2005) reported that mothers who self-reported chronically elevated, but not briefly elevated, symptoms of depression had children with lower scores on the BSID MDI and Psychomotor Development Index (PDI) at 15 months. However, there were no detectable differences attributable to maternal depression on receptive or expressive language, as assessed through an interviewer-completed scale based on mothers' responses to structured questions at 12 months. In attempting to explain this discrepancy, the authors cite the relatively high SES of their sample, the use of maternal reports, and the possibility that effects may be delayed.

There may be another explanation. Many items from the BSID-I and -II that form the basis for the MDI directly reflected language development (Bayley, 1969; 1993; 2006). Perhaps the lower MDI scores among infants of chronically depressed mothers were driven, in whole or in part, by a delay in language development – a delay not detected by responses to structured interview questions completed by depressed mothers of 12 month olds. Similarly, prior effects of maternal depression on child cognitive development using the BSID-I or –II (e.g., Lyons-Ruth, Connell, Zoll, & Grunebaum, 1986; Murray et al., 1996; Whiffen & Gotlib, 1989) may be at least partially attributed to effects on language development. Interestingly, in a recent study on the relation between child language skills and the development of concern for others, an initially significant correlation between BSID-II general cognitive ability and concern for others was no longer significant when early language skills, as assessed separately from the BSID-II, were taken into account (Rhee et al., 2013).

If the language-laden nature of the BSID-II MDI masked early effects of maternal depression on language development in infants, the third revision of the Bayley scales (BSID-III) might provide the sensitivity necessary to detect language delays. This is because in the BSID-III language-based items were removed from the MDI, and infant mental developmental status was partitioned into a three-scale structure: A Cognitive Scale (*Cog*), which has reduced reliance on the child's language ability relative to the BSID-I or –II, and a two-part Language Scale, which separately assesses Receptive Communication (*RC*) and Expressive Communication (*EC*). Many of the language-based items that were removed from the BSID-II MDI were subsequently incorporated into the *RC* and *EC* BSID-III scales.

The current report describes an analysis of the effects of maternal depression on early cognitive-linguistic development using the BSID-III. We predicted that 1-year-old infants of mothers with elevated symptoms of depression would demonstrate delays in communicative development, but possibly not in general cognitive development.

2. Method

2.1. Participants

As part of a larger study on postpartum depression and child development, a community sample of 91 mothers and their infants were recruited from advertisements in a free local parenting magazine (n = 79), flyers distributed at Early Head Start Centers (n = 8), and an advertisement on Facebook (n = 4). In an attempt to over-recruit mothers with symptoms of depression, the text of the advertisement stated that we were investigating how mothers talk to their infants and, although all mothers were invited to participate, we were particularly interested in mothers with a history of depression.

For the present sample, the mothers' ages ranged from 19 to 40 years, with a mean age of 29.9 years (SD = 5.2). Infant age ranged from 308 to 429 days, with a mean age of 364.8 days (SD= 31.1). Mothers' mean education level was 5.5 (SD = 1.4; where 5.0 = earned an associate's degree, and 6.0 = earned a bachelor's degree). Seventy mothers were currently married (76.9%) and 21 were not. Household income ranged from between $0–$6,000 (n = 6) to more than $50,000 ($n$ = 46), with a median income category of $40,000–$50,000. Fifty-eight of the mothers were Caucasian (63.7%), twenty were Latina (22.0%), six were African-American (6.6%), four were Asian (4.4%), and three were Native American (3.3%). Forty of the infants were boys (44.0%) and 51 were girls.

2.2. Bayley Scales of Infant and Toddler Development (BSID-III)

The Bayley Scales of Infant and Toddler Development-III (BSID-III; Bayley, 2005; 2006)were used to assess infant cognitive and language development (the motor and adaptive behavior scales were not administered). The items on the Cognitive Scale (*Cog*) of the BSID-III assess sensorimotor development, exploration and manipulation, object relatedness, concept formation, memory and other cognitive abilities. Relative to the BSID-II (Bayley, 1993), the BSID-III *Cog*scale is less reliant on the child's language comprehension; because not all of the previous items were carried over from the BSID-II Mental Scale, expansion of the cognitive constructs in the BSID-III was possible. Thus, the BSID-III *Cog*sc ale has a greater emphasis on play, expanded coverage of information-processing – with items assessing speed of processing via rate of habituation and responses to change in stimulation – and problem-solving tasks of escalating complexity (Bayley, 2006).

The Language Scale evaluates Receptive and Expressive Communication (*RC* and *EC*). The *RC* scale assesses auditory acuity, as well as preverbal behaviors related to vocabulary development, including being able to identify objects and pictures, and otherwise respond to words. The *EC* scaleassesses the child's ability to vocalize, and includes items on babbling, gesturing, joint referencing, turn-taking, first words, and object/picture naming.

The BSID-III exhibits good reliability, with reliability coefficients ranging from .74 to .92 for the *Cog*, *RC*, and *EC* scales in the age range studied here. Scale convergent and discriminant validity are also high (Bayley, 2006).

BSID-III scales were administered by M.A.-level graduate students, trained and supervised by an experienced child clinical psychologist. On average, administration took between 30 and 60 minutes. BSID-III testers were blind with respect to maternal self-reports of symptoms of depression. The data presented here for each subscale are percentile ranks relating the child's performance to age-based norms. However, all analyses carried out on percentile scores were repeated with raw scores, with the same results.

2.3. Assessment of depression

Symptoms of depression were assessed using the Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996), a 21-item self-report measure that asks about affective, cognitive, motivational, and physiological symptoms associated with depression experienced in the past 2 weeks. The BDI-II has moderate to high correlations with clinical ratings for psychiatric patients (Steer, Ball, Ranieri, & Beck, 1997).

2.4. Procedure

At the start of the lab visit, mothers read and signed the consent forms for the questionnaires, interview, and BSID-III assessment. Then, the mother filled out the BDI-II and other questionnaires. Following that, the infant was administered the cognitive and communication subscales of the BSID-III assessment. Finally, the clinical interviewer conducted the SCID interview with the mother.

2.5. Data analysis plan

Preliminary analyses examined the relation between demographic variables, elevated BDI-II scores, and BSID-III performance. Next, relations between elevated BDI-II scores and BSID-III performance were analyzed using correlational techniques and hierarchical linear regression. Because a number of prior studies showed greater effects of maternal depression on boys than girls (Kurstjens & Wolke, 2001), main effects of child gender and interactions between maternal depression and child gender were investigated as they related to BSID-III scores. It was hypothesized that maternal self-reports of depression would predict BSID-III performance, particular communicative performance, after key demographic variables had been taken into account. Although a meditational hypothesis about cognitive and linguistics development based on maternal "scaffolding" has been discussed above, no attempt to test this hypothesis was undertaken in this preliminary study.

3. Results

3.1. Demographic and Diagnostic Information

Information concerning demographic and depression self-report information for the 91 mother-infant dyads recruited to the study is presented in Table 1. Thirty mothers had elevated scores on the BDI-II (BDI-II > 13; 33.0%), and 61 had non-elevated scores (BDI-II ≤ 13). Within the "elevated' group, 18 scored in the "mild" range (BDI-II = 14–19); 9 scored in the "moderate" range (BDI-II = 20–28); and 3 scored in the "severe" range (BDI-II = 29–63). Because of relatively small numbers in the moderate and severe categories, those two categories have been combined below. Mothers with elevated BDI-II scores (BDI-II > 13) were significantly less likely to be married than mothers with non-elevated BDI-II

scores ($z = 2.15$, $p = .05$). Fourteen of 91 mothers reported that they were currently taking anti-depressant medication, including 8 with BDI-II scores in the "non-elevated" range, 4 with scores in the "elevated/mild" range, and 2 with scores in the "elevated/moderate-to-severe" range.

3.2. Bayley Scales of Infant and Toddler Development (BSID-III)

Percentile data for the BSID-III (*Cog*) subscale were available for 91 infants. Data for the *RC* and *EC* subscales were available for only 80 of these, because 11 of them became fussy as the assessment progressed and did not complete the items on which those subscales were based.

3.2.1. Demographic variables and BSID-III scales—Table 2 presents a correlation matrix showing the relations between BSID-III scales and demographic variables. Bayley *Cog* percentiles were unrelated to mother's age, education, family income, marital status (contrast coded as 1 = married; −1 = unmarried), minority status (contrast coded as 1 = ethnic minority; −1 = white), number of children, infant gender, and current anti-depressant medication use. Bayley *RC* and *EC* percentiles were similarly unrelated to all demographic variables, except for a negative correlation with number of children, and an effect of gender. Table 3 presents mean percentile scores as a function of infant gender. Collapsed across BDI-II categories, means were higher for girls than boys for each BSID-III subscale.

3.2.2. Maternal mood and BSID-III scores—Table 2 presents first-order correlations between BDI-II scores and percentile scores on the three BSID-III scales. BDI-II scores were significantly negatively correlated with Bayley *EC* scale percentiles, $r(80) = -.31$, $p = .01$, but did not correlate significantly with *Cog* or *RC* scale percentiles (p's > .10). The relation between BDI-II category and Bayley *EC* percentiles was further examined using a hierarchical linear regression, in which child gender, number of children, and a gender x BDI-II category interaction term were entered into the equation in steps 1–3, followed by BDI-II category in step 4. Table 4 shows that infant gender and number of children, but not the gender x BDI category interaction term, were associated with significant increments in R^2 in steps 1–3. However, after demographic variables had been taken into account, a mother's BDI-II category accounted for a significant further increment in the proportion of variance accounted for in infant *EC* percentiles, $\Delta R^2 = .056$, $F(1, 75) = 5.12$, $p = .05$.

4. Discussion

The purpose of the present study was to tease apart the relation between maternal depression and cognitive versus communicative development using the revised BSID-III in 1-year-olds. In fact, there was no evidence for this age and sample that a self-report measure of maternal depression, alone or in conjunction with child gender, had any effect on general cognitive development. There was similarly no evidence for effects of maternal depression on receptive communication (*RC*) subscale. In contrast, BDI-II scores predicted significantly lower percentile scores on the expressive communication (*EC*) subscale. Although girls performed better than boys on the *RC* and *EC* (but not *Cog*) scales, gender and BDI-II scores did not interact, as they have in a number in some prior reports. Given that several studies have failed to find any effects on cognitive or linguistic development of maternal depression

in the first year of the infant's life, the effect on the *EC* scale in a low-risk sample is noteworthy, and may reflect positively on the sensitivity of the revised Bayley scales.

The finding of a developmental delay in expressive communication in infants of depressed mothers extends the detection of a language effect to an earlier age than previously reported, generally consistent with studies linking maternal depression to delays in language development (NICHD ECCRN, 1998; Stein et al., 2008) and lower verbal IQ (Cicchetti et al., 2000) in older children. However, that no effect was observed in receptive communication suggests that those effects may take longer to manifest, or require additional factors such as greater contextual risk to be detected at this age (Kurstjens & Wolke, 2001).

The absence of evidence for delays in general cognitive development, as had been reported in a few previous studies (Azak, 2012; Cornish et al., 2005; Feldman & Eidelman, 2009; Lyons-Ruth et al., 1986; Murray et al., 1993; NICHD ECCRN, 1999; Whiffen & Gotlib, 1989), is consistent with the hypothesis that some earlier reports of significant effects of maternal depression on BSID-I and -II performance may reflect effects on communicative rather than general cognitive development. The earlier BSID MDI was heavily dependent on language-based items. If these had been factored out, no effects on mental development might have remained (see Rhee et al., 2013).

However, this is unlikely to be the whole story, especially with higher-risk samples. A number of studies have identified effects on cognitive development independent of the Bayley scales, including studies using other standardized tests with separate subscales for different cognitive-linguistic abilities (Coghill et al., 1986). Further, laboratory-based studies have suggested effects of maternal depression on specific cognitive abilities, such as the development of object permanence (Murray, 1992).

Although consistent with the hypothesis that disruption of maternal support of pre-linguistic infants rudimentary speech and language processing slows the development of infant communication skills, the present study did not explicitly test this hypothesis. Any number of factors, including possibly genetic or epigenetic factors, could have contributed to these effects. However, although caregivers' socioeconomic status is known to affect child vocabulary development (Hart & Risley, 1995), neither maternal education nor family income predicted infant performance on any of the Bayley scales here. Similarly, anti-depressant medication may affect the timing of a child's commitment to the native language (Weikum et al., 2012), but it had no effect on Bayley scale performance in this small sample.

Still, whether deficits in the quantity or quality of maternal input, including the use of IDS, had any effect remains to be determined. As was reviewed above, there is evidence that the quantity and quality of language input to which a child is exposed affects vocabulary development. The volume of IDS to which an infant is exposed correlates with the rate of language growth, and this relationship is mediated by the efficiency of language processing as measured in a laboratory task (Weisleder & Fernald, 2013). The extent of pitch modulation in a brief segment of depressed and non-depressed mothers' IDS has been shown to correlate with concurrent maternal reports of productive vocabulary on the

MacArthur Communicative Development Inventory at 12 months postpartum (Porritt et al., 2014), but additional research is needed to elucidate the underlying mechanism.

One alternative explanation of the present findings is that lower *EC* scale percentiles in infants of depressed mothers may reflect a performance rather than a competence problem, in that these infants may exhibit less positive affiliative behavior and a pattern of relatively more socially inhibited behavioral interactions with adults (Field et al., 1988; Rubin, Both, Zahn-Waxler, Cummings, & Wilkinson, 1991; but cf. Jones et al., 2009). Such behavioral tendencies may suppress evidence for expressive communication abilities, including vocalizations and gesturing, in infants of depressed mothers. Along similar lines, EEG analyses of depressed adults and their children, including infants, reveals a pattern of relative left frontal EEG hypo-activation, which has been interpreted as an indication of decreased activity in the brain's approach system (Dawson, Klinger, Panagiotides, Hill, & Spieker 1992). This pattern of EEG activity has been observed in 13- to 15-month-old infants of depressed mothers in interactions not only with their mothers but also with a familiar, non-depressed adult (Dawson et al., 1999).

However, concerns about behavioral inhibition and Bayley scales performance in infants of depressed mothers do not necessarily mean that the present findings are artifactual or independent of cognitive-linguistic processing. Rather, they may be part of a cascade of negative consequences of disordered early caregiver-infant interactions. For example, the pattern of infant EEG left frontal hypo-activation has been linked to relatively less sensitive parenting behavior on the part of depressed mothers, and there is evidence that the infants of depressed mothers find social interactions to be more stressful than do controls (Embry, Dawson, & Borkowski, 2002). Furthermore, children of depressed mothers who show the pattern of left frontal EEG hypo-activation also exhibit deficits in empathy and mutuality (Jones, Field, & Davalos, 2000). Interestingly, expressive communication skills are positively correlated with the development of empathy and concern for others in young children (Rhee et al., 2013). This relation may be mediated by effects of mother-infant interactions on the development of the infant's ability to take another's perspective, which in turn may be a key component to a more fully developed theory of mind (Tronick & Weinberg, 1997).

There were several limitations to the current study. First, the number of infants involved was relatively small. Second, depression was measured using a self-report scale, rather than clinical diagnosis. Third, this cross-sectional study on 1-year-olds provides very limited information on the process by which maternal depression affects infant expressive communication development, and tells us nothing about how effects might change with age.

Although preliminary, these findings suggest that delays in expressive communication in infants of depressed mothers are detectable at a very early age. Interventions within the first postpartum year designed to prevent or lessen delays in language development in this population, possibly involving caregiver education about the importance of the quantity, quality, and contingent delivery of vocal stimulation they provide, may therefore be effective.

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Highlights

- One-year-old infants of mothers with elevated symptoms of depression had significantly lower percentile scores than infants of non-depressed controls on the Bayley Scales of Infant and Toddler Development (BSID-III) expressive communication (*EC*) scale, but not on the receptive communication (*RC*) scale, cognitive (*Cog*) scale, or socio-emotional (*SE*) scale.
- Girls scored higher than boys on the *EC*, *RC*, *SE*, but not *Cog* scales, but gender and maternal depression did not interact.
- No deficits were found in the infants of mothers diagnosed with depression in remission.
- Anti-depressant medication use was unrelated to Bayley scale performance

Table 1

Maternal Demographic and Self-Report Depression Data

Variable	BDI-II ≤ 13	BDI-II > 13
N	61	30
Age of mother (yrs)	30.0 (4.6)	29.3 (6.3)
Age of infant (days)	365.9 (31.2)	362.4 (31.1)
Infant gender (♀/♂)	36/25	14/16
Ethnicity		
White	42 (68.9%)	16 (53.3%)
Latina	11 (18.0%)	9 (30.0%)
African-American	4 (6.6%)	2(6.7%)
Asian	3 (4.9%)	1 (3.3%)
Native-American	1 (1.6%)	2 (6.7%)
Marital status		
married	51	19
unmarried	10	11
Mother's education	5.7 (1.4)	5.2 (1.3)
Family income	6.5 (2.0)	5.7 (2.7)
Number of children	1.7 (1.0)	2.1 (1.1)

Table 2

Correlations Between Bayley Scales and Demographic Variables

	1	2	3	4	5	6	7	8	9	10	11	12
1. Bayley *Cog*	-	.41**	.20	−.09	−.08	.10	−.02	.02	−.10	.00	.06	.13
2. Bayley *RC*		-	.36**	−.03	.11	.14	−.16	.20	−.25*	−.21	.03	.12
3. Bayley *EC*			-	−.21	.02	−.09	.10	.10	−.24*	−.33**	−.31**	−.03
4. Mother Age				-	.28**	.42**	−.25*	.34**	.07	.25*	−.05	.04
5. Mother Educ					-	.45**	−.28**	.39**	−.17	−.32**	−.15	.10
6. Family Income						-	−.58**	.63**	−.19	−.08	−.23*	−.03
7. Minority Status							-	−.51**	.16	.20	.17	.06
8. Marital Status								-	−.15	−.09	−.28**	.02
9. Infant Gender									-	.30**	.14	−.01
10. # Children										-	.27**	−.05
11. BDI-II score											-	.10
12. Medication												-

* signifies $p = .05$;

** signifies $p = .01$.

Table 3

Mean Bayley Subscale Percentile Scores (with Standard Deviations) as a Function of Infant Gender and BDI-II Category

		n	*Cog*	*RC*	*EC*
Girls	Non-elevated	29	.644 (.269)	.448 (.223)	.558 (.180)
	Mild	9	.775 (.241)	.580 (.296)	.591 (.225)
	Moderate/severe	5	.542 (.198)	.314 (.197)	.374 (.155)
	Total		**.660 (.260)**	**.460 (.243)**	**.543 (.194)**
Boys	Non-elevated	22	.554 (.208)	.303 (.224)	.489 (.271)
	Mild	9	.573 (.310)	.341 (.312)	.466 (.198)
	Moderate/severe	6	.577 (.404)	.417 (.336)	.187 (.132)
	Total		**.562 (.263)**	**.331 (.262)**	**.434 (.258)**

Table 4

Hierarchical Linear Regression of Infant Gender, Number of Children, Gender x BDI-II Category Interaction, and BDI-II Severity Category on Bayley Expressive Communication (EC) Percentiles

		Model 1			***Model 2***			***Model 3***			***Model 4***	
Variable	***B***	***SE B***	***β***	***B***	***SE***	***β***	***B***	***SE B***	***β***	***B***	***SE B***	***β***
Gender	*−5.45*	*2.53*	*−.24**	*−3.40*	*2.58*	*−.15*	*−2.18*	*4.42*	*−.10*	*−2.41*	*4.31*	*−.11*
# Children				*−6.05*	*2.44*	*−.28**	*−5.97*	*2.46*	*−.28**	*−4.50*	*2.48*	*−.21*
Gender x BDI							*−0.09*	*2.67*	*−.07*	*−0.75*	*2.60*	*−.05*
BDI Category										*−7.78*	*3.44*	*−.25**
R^2		*.056*			*.126*			*.127*			*.183*	
F for ΔR^2		*4.64**			*6.16**			*0.11*			*5.12**	

* $p = .05$