The influence of maternal depression, caregiving, and socioeconomic status in the postnatal year on children’s language development

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Abstract

Background. Postnatal depression is common and has been associated with adverse effects on children’s later emotional and behavioural development. The evidence for effects on children’s cognitive development is unclear but this could potentially be a major public health issue. The aim was to examine whether maternal depression and maternal caregiving during the first year of life are associated with children’s subsequent language development.

Methods. 1,201 women were recruited from antenatal and postnatal baby clinics in two areas in England, and followed up until their babies were 3 years. Mothers and children were assessed by questionnaire, interview and home observation; 999 children’s language was assessed at 36 months, although 55 were excluded principally because they had been exposed to insufficient English.

Results. In bi-variate analyses maternal depressive symptomatology in the postnatal year but not at 36 months was associated with poorer child language at 36 months; maternal caregiving, was positively associated with language. Structural Equation Modelling (SEM) revealed that depression was associated with poorer caregiving but was not independently associated with language. Higher quality caregiving at 10 months was associated with better language. When the sample was split by socioeconomic factors the effects of depression on caregiving were stronger in the less advantaged group. In both groups poorer quality early caregiving predicted lower language outcome.
Conclusions. Postnatal depression had a negative effect on caregiving, which in turn affected language; postnatal depression did not have an additional direct effect on language. Socioeconomic factors moderated the effects of depression on caregiving. When targeting interventions at mothers with postnatal depression, it may be strategic to focus on lower socioeconomic groups at higher risk.
Introduction

There has been enormous interest in the relevance of children’s experiences in the first year of life, especially adversity, for later cognitive development. Language is a key aspect of cognitive development and it is especially important because it underlies much communication between parents and young children, and predicts subsequent academic achievement. There is good evidence that the quality of care provided by mothers to their children including their speech, responsivity and cognitive stimulation influences children’s early language development (Raviv et al., 2004; Sohr-Preston and Scaramella, 2006). Of particular relevance to these findings is that maternal depression in the postnatal year has been identified as a phenomenon that has the potential to adversely affect the quality of care provided by the mother (Cooper and Murray, 1998).

Maternal postnatal depression is recognised as a major public health issue because of its high prevalence, estimated to be around 13% (O’Hara and Swain, 1996). While there is now fairly clear evidence that postnatal depression is associated with adverse effects on children’s later emotional and behavioural development (Cooper and Murray, 1998), the evidence for effects on children’s language and cognitive development is inconsistent (Cogill et al., 1986; Sharp et al., 1995; Murray et al., 1996; Brennan et al., 2000; Hay et al., 2001; Kurstjens and Wolke, 2001; Milgrom et al., 2004; Sohr-Preston and Scaramella, 2006). The possible influence of maternal depression on children’s language development, either directly or indirectly through caregiving, is important clinically because the prevention of delayed language development represents a major challenge to health services. It also has the potential to illuminate critical scientific issues in relation to the influence of early experience on later development (Hay et al., 2001).
The critical factor linking postnatal depression to child language is likely to be the quality of maternal caregiving. Maternal postnatal depression has the potential to negatively affect caregiving because of symptoms such as sadness, withdrawal, irritability, and pessimism about the future. When depressed, one’s mind is dominated by recurrent negative thoughts which in turn interfere with one’s capacity to respond to one’s interpersonal environment. However, not all research has found links between depression and parenting, and there is now considerable evidence that the effects of depression on caregiving are moderated by socioeconomic factors (Lovejoy et al., 2000). One of the possible explanations for the different findings in relation to postnatal depression and cognitive outcome is that studies such as those by Murray and colleagues (Murray et al., 1996) which found no direct relationship between depression and children’s language were carried out with relatively socioeconomic advantaged families, while the study carried out by Hay and colleagues (Hay et al., 2001) with inner-city disadvantaged families found direct effects of maternal depression on cognitive development. This indicates that postnatal depression may have different effects on caregiving and child outcome depending on the socioeconomic context (NICHD, 1999). It is therefore important to study samples large enough to examine the effects separately for socioeconomic disadvantaged and advantaged families rather than simply to take account of socioeconomic factors in the analyses.

Despite the potential inter-connectedness of socioeconomic status, parenting, maternal depression, and children’s cognitive and language outcomes, and the need to elucidate the processes that link these factors, hardly any studies have focussed on all
these characteristics simultaneously and sample sizes have generally not been large enough to unravel the way in which they are related.

A further issue is that most of the research in this area has not included measures of the provision of opportunities for cognitive stimulation and learning as part of maternal caregiving which may be compromised by depression.

The purpose of this paper is to examine the relationship between postnatal depression, maternal caregiving and socioeconomic factors in influencing children’s language development at 3 years of age in a large longitudinal cohort. Furthermore, it aims to examine whether any effects of maternal depression on caregiving and ultimately on language development differ in disadvantaged compared to advantaged socioeconomic groups.

**Methods**

**Participants**

The participants for this study were drawn from a longitudinal study of the influence of child care on children’s development. Recruitment centred on antenatal clinics held in two large hospitals in England, in North London and in Oxfordshire, each catering for a demographically diverse population. In addition a number of community postnatal baby clinics were included to reach more disadvantaged families. Eligibility criteria for mothers included: aged 16 or over at the child’s birth, adequately fluent for interview in English. Eligibility criteria for children were: singleton, birth weight 2500 grams or more, gestation of 37 weeks or more, no significant congenital abnormalities, no more that 48 hours in a Special Care Baby Unit.
Researchers approached 1862 mothers at recruitment of whom 217 (11.6%) were found, to be ineligible for the study. Of the remaining 1645, 444 (27.0%) chose not to participate, making the final sample 1201.

At follow-up 1077 families were seen at 10 months and at 36 months 1036 mothers were interviewed and 999 children participated in the language assessment.

Procedure
For the present paper, data were drawn from the information collected at 3, 10 and 36 months by face-to-face interviews with mothers, questionnaires, observations at home, and child assessments. This included demographic information, information on maternal depression (3, 10 and 36m), measures of maternal responsivity and stimulation (10 and 36m), and assessments of children’s language development (36m).

Measures

Demographic and Child Characteristics. Through structured interviews information was collected on: child gender, birth order and bilingualism; partnership/marital status; parental education; family income prior to maternity leave and postnatally; and mothers and their partner’s occupational status using the Socioeconomic Class index (SEC (Rose and O'Reilly, 1998)).

Maternal Depression. At 3 and 10 months mothers completed the Edinburgh Postnatal Depression Scale (EPDS (Cox et al., 1987)). The EPDS is a 10 item widely used and validated measure for screening for postnatal depression with a sensitivity and specificity of >80% (Murray and Carothers, 1990). At 36 months mothers completed the
12-item General Health Questionnaire (GHQ-12 (Goldberg, 1982)), as the Edinburgh Postnatal Depression Scale was developed specifically for a postnatal sample. The GHQ is a very widely used and validated measure of psychological symptomatology. Both these measures were treated as continuous variables in the analyses.

Maternal Care and Stimulation. At 10 and 36 months, maternal caregiving was assessed during 2 hour home observations, during which the home environments as well as unstructured mother-infant interactions were rated. At 36 months, the mothers also reported on their activities with their child.

Sub-scales on two observation instruments were coded at 10 months. The Home Observation for Measurement of the Environment (HOME (Bradley and Caldwell, 1988)) was used to assess the quality and quantity of support for emotional, social and cognitive development available to the child in the home environment (Bradley and Caldwell, 1988). One subscale was used for assessing maternal responsivity: Emotional and Verbal Responsiveness of Mother and three subscales were used for assessing the instructional/teaching qualities of the maternal care: Organisation of the Physical and Temporal Environment, Provision of Appropriate Play Materials, and Opportunities for Variety in Daily Stimulation. Inter-rater agreement between a gold standard rater and four raters of 20 child observations was κ = .70 to .74. To supplement the emotional and verbal responsiveness subscale, two subscales of the Caregiver Interaction Scale were used (Arnett, 1989): Positive Relationship, which measures the warmth, level of enthusiasm and developmental appropriateness of the caregiver’s interaction with children, and the Detachment subscale, which rates the extent to which the caregiver is
uninvolved with and uninterested in the children. Weighted mean Kappa coefficients of inter-rater agreement were $\kappa = .68$ to .74.

At 36 months, quality of maternal responsivity was measured again by direct observation using two instruments: first the toddler version of the HOME instrument was administered and this contains: the HOME *Pride, Affection and Warmth* subscale. Interrater agreement was $\kappa = .85$. Second, the Observation Rating Scale of the Environment (ORCE) (NICHD, 1996) was used and consists of a number of global constructs, of which the following were rated here: sensitivity / responsiveness to distress, sensitivity / responsiveness to non-distress, intrusiveness / overcontrol, detachment / disengagement, stimulation of cognitive development, positive regard for the child, negative regard for the child, and flatness of affect. Inter-rater agreement was weighted $\kappa = .86$

To obtain age appropriate information on the mothers’ provision of opportunities for learning at home, mothers were asked a series of questions on their child’s engagement in a number of stimulating activities. These questions were derived from the EPPE home interview (Melhuish et al., In press). Items covered activities which provide clear learning opportunities and were combined into one composite measure, called the Home Learning Environment.

For the purpose of this study, two aggregate scales were created at 10 and 36 months: *Maternal Responsivity* and *Opportunities for Learning*. At 10 months, maternal responsivity consisted of the two CIS subscales (positive relationship and lack of detachment) and the HOME emotional and verbal responsiveness subscale. Opportunities for learning consisted of the three relevant HOME subscales. At 36 months, maternal
responsivity consisted of the HOME: pride, warmth and affection subscale, and the ORCE and opportunities for learning consisted of the HLE (Melhuish et al., In press). This operationalisation of the caregiving constructs maximized conceptual overlap between the 10 and 36 month assessments, utilising age-appropriate measures at each time-point. These two constructs were then combined to form latent constructs representing the quality of maternal caregiving at both time points, which were then used in the structural equation models (see below).

*Child Language.* Language development was assessed at 36 months using the Reynell Developmental Language Scale (RDLS (Reynell, 1990)), a widely used and standardized instrument consisting of 124 items on 2 subscales, comprehension and expressive language. The Comprehension Scale measures receptive skills and the Expressive Scale assesses structure, vocabulary and content. Initially 999 children were administered the RDLS. However, after screening for bilingualism, 41 bilingual children with English as second language, and less than one year of exposure to English, and 14 children for whom the score was deemed unreliable for other reasons (n = 14; no evident language expression or comprehension, diagnosis of developmental disorder, or ill health), were excluded from the analysis. Bilingual children with English as first language, or children with two mother tongues were included, leaving a sample of n=944. All models included bilingualism as a control variable.
Analytic strategy

The present study sought to examine the inter-connectedness of socioeconomic status, parenting, maternal depression, and children’s language outcomes, including the testing for indirect pathways and moderation. First, bivariate correlation analyses were conducted to examine the associations between the different independent variables and the dependent variable (see Table). Second, with the aim of integrating variables on socioeconomic status, parenting, maternal depressive symptomatology, and children’s language outcomes in one conceptual model, Structural Equation Modelling (SEM) was carried out in AMOS 6.0 (Arbuckle and Wothke, 1995-1999). This permitted the examination of the complex pathways that might potentially shape children’s language development. In the baseline model (Figure 1) family socioeconomic background was represented by three indicators (average parental educational level, average parental occupational status and family income), depressive symptomatology at each time point as a continuous measure, the language outcome by its two subscales, and three covariates (bilingual, birth order and child’s gender), and maternal caregiving at 10 and 36 months by two indicators (maternal responsivity and opportunities for learning). Missing data (3.8%) were estimated using the Full Information Maximum Likelihood (FIML) method (Little and Rubin, 2002) (see Table for bivariate description). Non-significant paths were set to zero in all models. The following cut-offs for goodness of fit were used for good model fit: a non-significant $\chi^2$, a Root Mean Square Error of Approximation (RMSEA) below .05, and a Comparative Fit Index (CFI) and Non-Normative Fit Index (NNFI) above .95 (Browne and Cudeck, 1993, Marsh et al., 1996).
A particular focus was to investigate parenting as a possible mechanism that links postnatal depression to children’s language outcomes as well as to identify any possible direct effects of maternal depression on language development. Path analyses allowed the examination of the overall fit of a model that simultaneously included direct and indirect variables included in the study (see Figure 1). Thus, direct pathways from parenting at 10 months were included in this model, as well as indirect pathways through later parenting at 36 months. Regression paths between depression at each time point were included to estimate the stability of depression. Finally, the socio-demographic background was modelled to predict depression, language, and caregiving. Not shown in Figure 1 are the paths from the covariates (gender, bilingualism, birth order) to depression, caregiving and language.

In a next step we examined whether socioeconomic status moderated these complex relationships (Figure 2). A two-group comparison was carried out, whereby the sample was split on the sociodemographic variable into the top two thirds (n=633) (i.e. the top third and the middle third) and the lower third (n=311). This split was made on the combined variable (socioeconomic class, education, and income). It was decided to split off the lower third because approximately this proportion fell within the lower social classes in our sample (Sylva et al., 2007). Approximately 40% of mothers and 30% of fathers fell into this category.

**Results**

*Bivariate Correlations (see table)*
The presence of more maternal depressive symptoms at both 3, (r = -0.10, p<0.01) and 10 months (r = -0.10, p<0.01) but not at 36 months were associated with lower child language scores at 36 months (data) (see Table 1). Higher quality maternal caregiving at 10 and 36 months were related to higher language scores: rs were 0.28 and 0.35 (p<0.001) for maternal responsivity, and 0.24 and 0.26 (p<0.001) for mother’s provision of opportunities for stimulation at 10 and 36 months respectively. Depressive symptoms at both time points related to concurrent measures of caregiving; rs at 10 months were -0.09 and -0.11 (p<0.01) for responsivity and opportunities for stimulation; rs at 36 months were -0.08 (p<0.05) for responsivity and -0.11 (p<0.001) for stimulation. A number of sociodemographic variables were associated with higher language scores, including maternal and paternal education (r=0.31 and 0.28; p<0.001), social class (rs=0.29 and 0.37; p<0.001 for mother and partner) and family income (r=0.28; p<0.001). The child’s gender (female higher) (r=0.16; p<0.05) and birth order also related to children’s language scores, with later born children scoring lower (r=0.14; p<0.001).

Examining direct and indirect pathways from depression to child language (see Figure 1)
The baseline model fitted data well ($\chi^2 [193] = 317.43; p < .001; \chi^2/df = 1.645; \text{RMSEA} = .026; \text{CFI} = .984; \text{NNFI} = .979$). A higher sociodemographic background predicted lower maternal depression at 3 months (b = -0.19; p<0.001), higher quality caregiving at 10 months (b = 0.64; p<0.001) and language (b = 0.32; p<0.001). Caregiving was stable between 10 and 36 months (b = 0.87; p<0.001), and depression between 3 and 10 months (b = 0.63; p<0.001) and between 10 and 36 months (b = 0.25; p<0.001). Depressive symptoms did not predict language at either 10 or 36 months. However, depression at 10
months predicted lower quality concurrent caregiving (b = -0.09; p<0.05) and depression at 36 months predicted lower quality concurrent caregiving (b = -0.14; p<0.001).

Before examining the effects of caregiving on language in the full model, the effect of caregiving at 10 months and caregiving at 36 months on language was estimated separately, ie they were tested one at a time in the model. Thus, the effect of caregiving at 10 months on language was estimated to be, b = 0.26 (p<.001), while the effect of caregiving at 36 months on language was estimated to be, b = 0.34 (p<.001). When including caregiving at 10 and 36 months in one model, results showed that they were highly correlated (b = 0.88, p<0.001). This led to problematically large standard errors for the paths from caregiving to children’s language outcomes. To resolve this multicollinearity issue we used the method recommended by Marsh and colleagues (Marsh et al., 2004) in which the paths from 10 month caregiving to language, and 36 month caregiving to language were equated. This substantially reduced the standard errors and provided a better model fit, suggesting that caregiving at both 10 and 36 months contributes to language outcomes. Thus, both paths were found to be significant: b_unstand = 4.08; se = .57; standardised bs were 0.09 (p<0.001) and 0.29 (p<.001) for the respective paths from caregiving to language at 10 and 36 months. This final model is presented in Figure 1.

In addition, not shown in Figure 1, girls had higher Reynell scores than boys (b = 0.18; p<.001) and bilingual children had lower scores than monolingual children (b = -0.11; p<.001), but no effect of birth order was found. No significant effects of the covariates on depression or caregiving were found.
Examining socio-demographic background as a moderator of the relationship between depression, caregiving and language development (see Figure 2)

In order to test the hypothesis that depressive symptomatology has a stronger effect in lower socioeconomic families, the sample was split into two groups on the sociodemographic variable (top two thirds, lower third). The two-group model fitted data well ($\chi^2 = 383.89; p = .002; \chi^2/df = 1.26; \text{RMSEA} = .017; \text{CFI} = .987; \text{NNFI} = .983$). Factor loadings and indicator intercepts were equated across the two groups, while allowing the latent means to vary across the groups as a test of strong measurement invariance. A nested model was then conducted using a non-significant difference $\Delta \chi^2$ between a model in which the theoretically relevant beta-paths were freely estimated and a model in which these were constrained. Constraining all regression paths to equality across the two groups suggested a moderation effect ($\Delta \chi^2 = 38.10; p < .01$). A model in which four theoretically relevant regression paths were freely estimated fitted data as well as the model in which all paths were constrained ($\Delta \chi^2 = 30.98; p = .154$). As shown in Figure 2, the effect of depression at 10 months on concurrent caregiving was stronger in the disadvantaged ($b = -0.21; p < .01$), than in the advantaged group ($b = -0.13; p < .05$). The effect of depression at 36 months on concurrent caregiving at 36 months was also stronger in the disadvantaged ($b = -0.27; p < .001$), than in the advantaged group (which was not significant). Early caregiving was positively related to children’s language in both the disadvantaged and advantaged group ($b = 0.29$ and $0.22; p < 0.01$ respectively), and the same was true for the effect of concurrent caregiving on children’s language ($b = 0.28$ and $0.23; p < 0.01$ for the disadvantaged and advantaged group). Thus
the effect of caregiving on language was very similar in both advantaged and
disadvantaged groups

Discussion

In summary, in bi-variate analyses, maternal depressive symptomatology in the postnatal period but not 36 months was associated with poorer language development; maternal caregiving both postnatally and concurrently was positively associated with child language at 36 months while socioeconomic disadvantage was strongly associated with poorer language development. Structural Equation Modelling (SEM) revealed that depression at 10 months was associated with poorer caregiving which in turn had a negative effect on language at 36 months. Furthermore, poorer caregiving at 10 months was associated with caregiving at 36 months which in turn was associated with poorer language development. There was no evidence of an additional direct effect of postnatal depression on language. This indicates that maternal depression influences child language indirectly and that the pathway is through its negative effects on the quality of caregiving. Since socio-demographic variables are strongly associated with child language, the sample was then split by socioeconomic factors into more advantaged and less advantaged groups, and separate SEMs were run for each group. The adverse effect of depression on caregiving was considerably stronger for less socioeconomically advantaged families at both time points (in fact the effect of 36 month depression on caregiving in the higher SES group was not significant). The negative independent effect of poorer early maternal caregiving on language development was evident in both groups indicating that there was a direct relationship between the quality of caregiving and
language. Thus, there was evidence for a moderation effect of socioeconomic factors on the relationship between depression and caregiving but this moderation was not evident for the relationship between caregiving and language.

The strengths of the study were that maternal psychological state was measured twice in the postnatal year, at 3 and 10 months, and then again at 36 months concurrent with the language assessment. The quality of maternal caregiving was measured and observed in detail by direct observation and included maternal responsivity as well as the provision of opportunities for learning. Opportunities for learning have rarely been measured in these kinds of studies and this is an important component of caregiving especially in relation to language development. The sample of 944 infants was large compared to other similar studies. This relatively large sample allowed us to test whether the effects differed between more and less advantaged groups. The limitations of the study included the lack of a face-to-face interview in order to diagnose depression, instead the Edinburgh Postnatal Depression Scale, a well validated and widely used self-report measure, was used. The use of this self-report measure may have had the effect of over-estimating the levels of depressive symptomatology which may have weakened the statistical effect of depression on the outcome. While the same measure of maternal psychological state was used at 3 and 10 months (the Edinburgh Postnatal Depression Scale) a different one, the General Health Questionnaire, was used at 36 months because the EPDS had not been validated outside the postnatal period. A measure of maternal IQ was not obtained.

However, maternal education was assessed and used as a proxy. The detailed observations of the caregiving provided by the mothers were not carried out with fathers
on the entire sample hence the quality of the paternal caregiving could not be taken into account.

One of the critical scientific issues is whether experiences in the first year of life have longer term effects on children’s development. Brain development continues after birth and there is evidence that adverse social experiences can influence its development (Glaser, 2000). According to the sensitive period hypothesis certain environmental experiences exert a particularly strong effect on brain development during specific time periods in early life which affects longer-term outcome. It has been argued that the postpartum period represents such a period for cognitive development (Hay, 1997). While the design of this study does not provide a strict test of the sensitive period hypothesis, it does illuminate some relevant issues. It does suggest that for more socioeconomically disadvantaged children, the quality of caregiving does influence later language development. This confirms the importance of ensuring that positive policies should be in place to support parents in the postnatal period to enhance the quality of their caregiving especially when they are depressed. This study, along with others before it (NICHD, 1999; Sohr-Preston and Scaramella, 2006), confirm that maternal caregiving is especially vulnerable to depression in the context of lower socioeconomic status. In lower risk families, secure income or good social support might buffer the adverse effect of depression on parenting (Sohr-Preston and Scaramella, 2006).

These findings suggest that in targeting interventions in relation to postnatally depressed mothers and their infants, priority should be given to mothers living in situations of relative socioeconomic disadvantage. Furthermore, while most research has been concerned with increasing responsivity of depressed mothers, interventions need to
include a component in which the mother and other caregivers are supported to provide opportunities for cognitive stimulation and learning for their infants. A recent review of treatments targeted at the mother-infant relationship in the context of maternal depression concluded that it is possible to mitigate the impact of maternal postnatal depression on the mother–infant relationship and child development. However, most were relatively small studies with considerable variability in outcome and much work remains to be done particularly in identifying the key components of the interventions (Nylen et al., 2006). Large screening programmes have been introduced in some countries with the aim of identifying women suffering from postnatal depression. The ultimate aim is to support and treat these women, and to mitigate possible adverse effects on the child. Our findings suggest that because the pathway from postnatal depression to language is indirectly through caregiving, interventions should be focussed on enhancing mothers’ responsivity to their infants and the opportunities for learning that they provide. It is argued that such interventions could be conducted by primary healthcare workers. Further research could usefully be focussed on testing the hypothesis that a targeted intervention to help mothers with postnatal depression and their infants in the context of socioeconomic disadvantage, in their own homes, would enhance the cognitive development of their children.
Key messages

- In this study the pathway from postnatal depression to language occurred indirectly through its negative effects on caregiving which in turn affected language.
- There was no additional direct effect of postnatal depression on language.
- The pathway from postnatal depression to language occurred indirectly through its negative effects on caregiving which in turn affected language.
- The effects of postnatal depression on caregiving are moderated by socioeconomic status with evidence for considerably stronger effects on lower socioeconomic status groups.
- Community interventions aimed at helping mothers with postnatal depression.

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References


Table  Univariate correlations between all independent variables and language scores

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<td>1. Mother’s educational level 3m (1-6)</td>
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<td>3. Mother’s Socio Economic Class 3 &amp; 36m (1-3)</td>
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Note c = p<.05; b = p<.01, a = p<.001

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Note: c = p<.05; b = p<.01, a = p<.001
Figure 1. Sociodemographic background, maternal depression, caregiving, and language development (N = 944).

Note c = p<.05; b = p<.01, a = p<.001, Non-significant paths fixed to zero. * = paths fixed to equality.
Figure 2. Depression and caregiving as predictors of language development at 36 months, among disadvantaged (33% bottom $n = 311$) and advantaged (top 67%; $n = 633$) mothers

Note: All non-significant paths were set to zero (0.00 n.e.); non-significant paths are indicated by broken arrows. Coefficients for the two groups are presented alongside each other with the disadvantaged groups being presented before the dash, and the coefficients for the advantaged group after the dash. Where coefficients differ significantly between the two groups, they are printed in bold (standardized b-coefficients). Depression at 3 months and covariates not depicted for sake of clarity. c = p<.05; b = p<.01, a = p<.001. All estimates are from AMOS 6.0.