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Early School Outcomes for Children of Postpartum Depressed Mothers: Comparison with a Community Sample

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Abstract Previous studies of the long-term effects of maternal postpartum depression (PPD) on child development have mostly focused on a limited set of outcomes, and have often not controlled for risk factors associated with maternal depression. The present study compared children of postpartum depressed mothers ($n = 29$) with children from a community sample ($n = 113$) in terms of a broad range of developmental outcomes in the early school period. Controlling for risk factors associated with maternal depression, we found that children of postpartum depressed mothers had lower ego-resiliency, lower peer social competence, and lower school adjustment than the community sample children. In addition, girls of postpartum depressed mothers showed lower verbal intelligence, and, unexpectedly, showed fewer externalizing problems than their counterparts in the community sample. Results show that children's capacities to deal with stress and interact with peers in the early school period may be particularly affected by their mothers' PPD.

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Introduction

Approximately 13% of all children are exposed to maternal depression in their first year of life [1]. This exposure places children at increased risk for related risk factors, such as impaired mother–infant interactions and insecure mother–infant attachment [2]. High levels of stress, low quality mother–infant interactions and insecure attachment early in a child’s life can adversely affect the development of the brain, which can have long-term consequences, for example for the child’s capacities to regulate emotions and cope with stress [3, 4]. The apparent importance of the postpartum period for later development suggests that maternal postpartum depression (PPD) may have long-lasting effects on children’s development. However, only very few studies have so far investigated the long-term effects of PPD on child development, and most of them focused on only one or two developmental outcomes. The present study used an in-depth profile of children whose mothers had PPD, compared to children of a community sample at early school age, to examine what aspects of child development are most affected by maternal PPD. The child developmental outcomes that we studied were: (1) ego-resiliency, (2) self-esteem, (3) peer social competence, (4) intelligence, (5) school adjustment, (6) internalizing behaviour problems, and (7) externalizing behaviour problems. These outcomes were chosen because of their relevance for a child’s development and functioning in the school period and because they have all been found in earlier studies to be predictive of adolescent and adult functioning and adjustment [5, 6]. More knowledge about the association between PPD and these early school age outcomes of children can have important implications for the prevention of adult psychopathology. In the following paragraphs, we successively focus on the seven developmental outcomes. For each developmental outcome, we subsequently outline why it is deemed important, why we expect maternal PPD to have a negative effect on the outcome, what has been found regarding to the effect of PPD on this outcome in previous studies, and finally what our study may add to the results of any previous studies. So the results of earlier studies into the long-term effects of maternal PPD will be presented in separate paragraphs according to the developmental outcome in question.

The personality construct of *ego-resiliency* refers to the capacity to flexibly regulate emotions and cope with stress [7]. Ego-resiliency has been linked to effective adjustment and functioning in various domains of life, both in children [8] and in adults [9]. Ego-resiliency is assumed to be promoted by sensitive parenting in the first years of life [7], which has indeed been confirmed by empirical research [10]. Given that depressed mothers often lack sensitivity in interactions with their children [11, 12], children who have been exposed to early maternal depression can be hypothesized to be less ego-resilient later in life than those who have not. Some support for this hypothesis was found in studies of children’s emotional and behavioural responses during specific stressful events: early maternal depression was found to predict children’s distress in the context of losing a game [13], and children’s dysfunctional emotion regulation in response to witnessing simulated anger between their mother and an adult stranger [14]. The relation between maternal depression in infancy and children’s later ego-resiliency as a disposition across domains has not been examined in earlier studies.

School adjustment, or the capacity to adjust to the stress of the school environment, is conceptually related to ego-resiliency, but focuses on the children’s capacity to deal with

stress in a more specific domain, i.e., the school setting. To date, only one study has compared children of PPD mothers with children from a normative sample in terms of successful adaptation to school [15]. This study revealed no significant relationship between PPD and school adjustment, but the operationalization of school adjustment (i.e., general school readiness and personal maturity) differed from that in the present study.

The literature suggests that *self-esteem* is relevant to psychological well-being and that low self-esteem is one of the precursors of depressed moods [16–18]. Self-esteem is believed to have its foundation in early experiences with caregivers. Infants of insensitive or unresponsive mothers, like many mothers with PPD, are thought to develop a negative ‘internal working model’ of the relationship, including negative expectations regarding the child’s own competence and love-worthiness [19]. Previous studies have shown that maternal depression, occurring at some point in a child’s life, is associated with concurrent and subsequent lower self-esteem in the children at different ages [13, 20–23]. We have found no prospective studies reporting on the relation between maternal depression occurring specifically in the first year of life and children’s self-esteem at a later age.

Another developmental outcome that we examined in relation to maternal PPD is children’s *peer social competence*. Peer social competence is assumed to mediate the relation between insensitive caregiving in infancy and psychological problems in adulthood [24]. Children develop important competencies during high-quality interactions with their parents (e.g., empathy, cooperation, self-regulation), which may facilitate interactions with peers [25]. The generally low quality interactions that have been observed between postpartum depressed mothers and their infants may therefore put the children at increased risk of developing problems in interactions with peers. Indeed, early maternal depression has been found to be related to children’s later social competence, as rated by mothers, at 3 years of age [26], and at 8–9 years of age [27]. In the present study, we used teacher reports on the children’s peer social competence.

The postpartum period has been suggested to be a sensitive period for cognitive development [28]. Caregivers play a prominent role in children’s cognitive development through the quality of their interactions with the child [28–30]. Moreover, high quality interactions protect children against stress [31], and high levels of stress early in life may adversely affect brain development and later cognitive functioning [32, 33]. Given the stressful context of maternal depression in a period deemed to be very important for cognitive development, an adverse effect of PPD on children’s *intelligence* can be expected. Some studies have indeed found evidence of such an adverse effect, particularly in boys and in children from low-SES families [34, 35], but other studies failed to find such an effect [36].

The final aspect of the children’s functioning that we assessed in the present study was the occurrence of *internalizing and externalizing behaviour problems*. Given that low-quality parent–child interactions are an important determinant of later behaviour problems [37], children of PPD mothers can be expected to be at risk for developing such problems. Although the results of earlier studies are somewhat inconsistent, there is empirical evidence for elevated levels of both internalizing and externalizing behaviour problems in children of PPD mothers [15, 38–40]. Other studies, however, did not find a relation between maternal PPD and later behaviour problems in the children [41, 42]. The present study differs from earlier studies in two respects. First, whereas earlier studies mostly used maternal reports only, we assessed both teacher-reported and mother-reported behaviour problems. Second, we used a stricter definition of postpartum maternal depression than most earlier studies, by including only mothers with a clinical diagnosis of depression occurring specifically in the first year of the child’s life.

Previous research into children of PPD mothers has found that not all children show unfavourable development. It has been suggested that the functioning of these children depends on the presence of additional contextual risk factors related to depression [43]. Examples of risk factors that have been found to be associated with depression included partner conflict, single-parenthood, low education and stressful life events [44–46], which have all, in turn, been related to greater risk of adverse outcomes in children [47–49]. The interrelation between maternal depression and other risk factors may have two implications. First, it is possible that the depressed mothers' increased risk of additional risk factors accounts for the relation between PPD and later child outcomes found in some studies. The extent to which studies of the influence of PPD on child outcomes have controlled for risk factors associated with PPD varies greatly. In the current study, we examined which potential risk factors for the children's development were associated with sample status, and controlled for these factors when comparing the PPD sample with the community sample. Second, the associated risk factors may present an additional risk of adverse developmental outcomes in the offspring of depressed mothers. We therefore also examined whether the associated risk factors moderated the outcomes in children of PPD mothers. Child gender was also studied as a potential moderator, since some studies have found that sons of PPD mothers were more at risk for adverse outcomes than daughters of PPD mothers [34, 40].

To sum up, our study examined whether maternal PPD in the child's first year of life was related to more adverse developmental outcomes for the child in the early school period. We expected that children exposed to maternal depression in their first year would show less favourable developmental outcomes than children from a community-based sample, even when controlling for associated risk factors. Based on previous research into children of PPD mothers, we further expected that the differences in child outcomes between the PPD sample and the community sample would be more pronounced in multiple-risk families, and in boys as compared to girls.

Methods

Participants

This study compared data from the early school age assessments in two longitudinal studies both conducted in The Netherlands, which followed children from infancy until early childhood, using largely the same instruments. Both longitudinal studies were approved by the local ethical committee for research on human subjects (CMO) Arnhem-Nijmegen in The Netherlands, and informed consent was obtained from all participants. The first sample consisted of 29 mothers and their children who participated in a study of the effects of PPD on the offspring, in combination with an examination of a preventive intervention [50, 51]. Mothers with an infant aged up to 12 months were recruited at eight mental health centers in The Netherlands, if they met the following inclusion criteria: (a) having a diagnosis of a major depressive episode or dysthymia according to the DSM-IV criteria [52] (95%) and/or scoring above 14 on the Beck Depression Inventory [53] indicating increased levels of depressive symptoms (5%); (b) having adequate fluency in Dutch; and (c) receiving professional outpatient treatment for their depression. Mothers with psychotic disorders, manic depression and/or substance dependence were excluded from the study. The recruitment period was 2.5 years. Eighty-five mothers who met the inclusion criteria and agreed to participate were randomized to an experimental group receiving a preventive intervention ($n = 43$) or a control group not receiving the intervention ($n = 42$). In the current

comparison, we only used the mother–child pairs of the control group who did not receive the preventive intervention. Twenty-nine mothers and children (69%) of the original control group participated in the early school age assessment. Of these mothers, 79% were included at baseline based on a diagnosed major depressive episode, 7% were included based on diagnosed dysthymia, and 14% were included based on an increased level of depressive symptoms. Independent *t* tests comparing the demographics and other mother and child variables of the 13 mother–child pairs who dropped out from the study with those of the 29 mother–child pairs who remained in the study revealed that the dropout mothers had a lower educational level ($t = -2.76, p < .01$).

The data of the PPD sample were compared with those of a community sample consisting of primary caregivers and their children taking part in an ongoing longitudinal study [8, 37, 54]. The families were recruited from records of health-care centers in a medium-sized Dutch town. Over a period of nine months, all families with a 15-month-old child, from a range of socioeconomic status, were asked to participate in the study. Inclusion criteria were adequate fluency in Dutch and the absence of serious health problems of the child. One hundred and seventy-four of the 639 approached families responded, from which 129 mother–child pairs were randomly selected (the maximum number of participants considering the time and financial resources available for the project). The sample was found to be representative of the Dutch population in terms of demographics and other mother and child variables [30]. Of the original sample of 129 families, 116 mothers and children (90%) participated in the early school age assessment. Participants of this assessment did not differ significantly from the non-participants in terms of the major variables studied at 15 months, except for parental ego-resiliency, with primary caregivers who did not participate showing lower levels of ego-resiliency than those who did participate ($t = 2.08, p < .05$). Three parent–child pairs of the community sample were not included in the present comparison because the father was the primary caregiver in these families.

Procedure

The assessment and data scoring procedures were identical for the two samples, as the data collection in the PPD study was modelled after that in the community study for the purpose of the present comparison. Data were collected during a home visit and a school visit. Prior to the visits, the mothers completed two questionnaires on demographic variables, partner conflicts, stressful life events and child behaviour problems, while the teachers completed questionnaires on the child's peer social competence, school adjustment, and behaviour problems. While the child was seated at a table with the experimenter, the latter conducted a projective interview assessing the children's self-esteem and a test assessing their verbal intelligence. The projective interview was recorded on videotape. During the school visit, teachers received instructions to complete a Q-sort to assess children's ego-resiliency.

Instruments

Ego-Resiliency

A Dutch translation of the California Child Q-Set [7] was employed to enable the teachers to rate the children's ego-resiliency. The teachers sorted 100 personality items evenly into nine envelopes ranging from extremely uncharacteristic to extremely characteristic of the child. The Q-sort description of each child was subsequently correlated with the Q-sort of a prototypically ego-resilient child as provided by experts [7], and the correlation coefficient

was used as the ego-resiliency score. Higher correlation scores (which have a range from -1.00 to $+1.00$) indicated more ego-resiliency.

School Adjustment

The teachers evaluated how the children had adjusted to the stress in their school settings using a subscale of the Stress Response Scale [55]. Seventeen items (e.g., 'daydreams', and 'is demanding') were rated on six-point scales ranging from never (1) to always (6). In our study, the scale showed sufficient internal consistency (PPD sample: $\alpha = .90$; community sample: $\alpha = .89$).

Self-Esteem

We gauged the child's self-esteem using the Puppet Interview, adapted for 5- to 7-year-olds [56, 57]. The interviewer asked the child 20 questions about its 'worthiness' via a hand-held doll operated by the child. The literature supports the validity of the adapted version [58]. All recorded interviews were transcribed verbatim and the reports were rated by two trained coders blinded to all other information about the child and the mother. The inter-coder correlations were 0.86 in the PPD sample, based on 50% of the interviews, and 0.92 in the community sample, based on 25% of the interviews. Each child received a score on a six-point scale for 'positiveness of self' based on the number and intensity of the child's negative and/or positive answers.

Verbal Intelligence

The children's verbal intelligence was assessed with the Dutch translation of the Peabody Picture Vocabulary Test-Revised (PPVT-R) [59] in which the child is asked to point to one of four pictures that best represents the meaning of the word that is spoken aloud. Raw scores were converted to standard scores ($M = 100$, $SD = 15$) based on chronological age norms. The reliability and validity of the PPVT-R are widely acknowledged [60].

Peer Social Competence

In accordance with Verschueren and Marcoen's study [61], a composite variable for peer social competence was computed by means of three measures assessing prosocial behaviour, popularity and acceptance by peers as rated by teachers. A 10-item subscale of the Preschool Social Behaviour Questionnaire (PSBQ) 62 measured children's *pro-social behaviour*. Items reflecting behaviours involving helping peers and exhibiting concern for them were rated by the teachers on a four-point scale ranging from not applicable (0) to fully applicable (3). The PSBQ has been found to have good predictive validity and test-retest reliability [62]. *Popularity* among peers and *acceptance* by peers were both rated by teachers on a six-point scale from 0, 'very unpopular' or 'not accepted at all', to 5, 'very popular' or 'completely accepted'. Standardized scores of the three measures were summed. Intercorrelations were 0.40 ($p < .000$) for prosocial behaviour and popularity, 0.38 ($p < .001$) for prosocial behaviour and acceptance, and 0.49 ($p < .001$) for popularity and acceptance. Cronbach's alpha of the composite variable in this study was 0.69.

Internalizing and Externalizing Behaviour Problems

The two samples used different versions of the Achenbach forms to evaluate child behaviour problems. In the PPD sample, the mothers and teachers completed the Child Behaviour Checklist (CBCL) and the Caregiver-Teacher Report Form (C-TRF) for ages 1.5–5 years [63]. In the community sample, the mothers and teachers completed the versions of the same instruments for ages 4–18 years [64, 65]. After consulting one of the developers of the Dutch versions of the ASEBA forms (J. van der Ende, personal communication, March 5, 2009) we decided to use the normalized *T* scores for total internalizing and externalizing problems to compare the different versions. Evidence for the reliability and validity of the CBCL as an index of child behaviour is well documented [66]. In our study, Cronbach's alphas for the CBCL and TRF internalizing and externalizing scales ranged from 0.75 to 0.94.

Maternal Education Level

A six-point scale was completed by the mothers, indicating their highest level of education at the time of the early school age assessment. The scale ranged from 0, elementary school, to 5, higher vocational education or university.

Presence of Partner Conflict

A subscale of a Dutch questionnaire for family problems [67] was used to measure partner conflict. Mothers rated five items reflecting problems in the partner relationship, such as disagreements about childrearing and providing or receiving little partner support, along a three-point scale ranging from never (0) to always applicable (2). Single mothers were asked to complete the items regarding the child's biological father. A total score of 5 indicates a score in the borderline range, which is high enough to reveal a relevant problem in the relationship with the partner or the child's biological father. A score of 6 or above is in the clinical range, indicating a clinically relevant problem in the relationship with the partner or the child's biological father. Evidence of the subscale's reliability and validity has been reported [30, 67]. Cronbach's alpha was 0.73 in the PPD sample and 0.82 in the community sample. One point was given for the presence of conflict with the partner when the mother's score was in the borderline or clinical range of the scale.

Separation from Biological Father

Mothers completed an item inquiring whether she and the child's biological father were living together (score = 0) or apart (score = 1) at the time of the current assessment.

Stressful Life Events

The mothers reported on the occurrence of stressful life events during the past 5 years through items derived from the Life Experiences Survey [68] and the Life Events Scale for Children [69]. The items were chosen because their content was likely to adversely affect children's development. Examples of stressful events in the mothers' lives are a serious accident, loss of a dear one, and being fired from a job, while being hospitalized and witnessing violence in the home are examples of stressful events in the children's lives. Both instruments have good psychometric qualities and have been employed in various

studies [37, 68, 69]. A total score for life events was computed by adding the numbers of reported life events for the mother and the child.

Statistical Analyses

In the preliminary analyses, we first checked the distributions of the measures for normality and examined their intercorrelations. One-way ANOVAs and Chi-square tests were used to examine differences between the samples in terms of various demographics and to identify potential risk factors that may be associated with depression.

In the main analyses, we first performed a multivariate test on the association between sample status and all developmental outcomes in GLM multivariate analyses of covariance. Demographic variables and potential risk factors for which the two samples differed significantly were controlled for in the analyses. Potential gender differences were also controlled for. Two-way interactions between sample status on the one hand and the associated risk factors and child gender on the other were examined to detect any moderating effects. When significant overall differences were found in the Wilks' Lambda multivariate test, the univariate tests were examined. The nature of significant interaction effects was determined by examining the main effects of sample status separately for the different levels of the moderator in GLM analyses of covariance, to statistically test the sample differences within the subgroups. Partial eta squared was used as an indicator of the effect sizes. Analyses were performed with a significance level of $p < .05$ (two-tailed).

Results

Preliminary Analyses

All continuous measures were checked for normality in both of the samples; all showed approximately normal distribution. Comparison of the intercorrelations of the child developmental outcomes at early school age for the children in the PPD sample and the community sample showed that 4 of the 36 intercorrelations were significantly different in the two samples. The most striking finding was that the correlations between child internalizing and externalizing problems were significantly higher in the PPD sample than in the community sample, both for mother-rated ($r = 0.74, p < .01$; and $r = 0.44, p < .01$, respectively) and teacher-rated problems ($r = 0.68, p < .01$; and $r = 0.14, ns$, respectively). This indicates that the children of PPD mothers were more likely to show combined internalizing and externalizing problems as observed by the mothers and the teachers. Another significant difference between the two samples was a stronger negative correlation between school adjustment and teacher-rated internalizing problems in the PPD sample ($r = -0.71, p < .01$) as compared to the community sample ($r = -0.35, p < .01$). The correlation between verbal intelligence and mother-rated externalizing problems was also significantly different between the two samples (PPD sample: $r = 0.28, ns$; community sample: $r = -0.14, ns$).

One-way ANOVAs and Chi-square tests were then used to examine differences between the two samples in terms of various demographics and potential risk factors (see Table 1). One-tailed tests were used for maternal educational level, living with a partner, presence of partner conflict, separation from the child's biological father, and stressful life events, because we expected differences in a more unfavourable direction for the PPD sample. The tests for the other variables were two-tailed. Results confirmed that the mothers in the PPD

Table 1 Descriptives of demographic variables and potential risk factors in the PPD sample and in the community sample

	PPD sample (<i>n</i> = 29)	Community sample (<i>n</i> = 113)	<i>F</i>	χ^2 (or Fisher's exact)
<i>Maternal characteristics</i>				
Mean age (in years)	35.9 (4.2)	36.9 (4.0)	2.38	
Dutch ethnicity (%)	93.1	96.5		0.64
Education level ^a (scale 0–5)	3.3 (1.5)	3.8 (1.5)	2.38 ⁺	
Living with partner ^a (%)	75.9	91.2		5.12*
Conflict with partner ^a (%)	29.6	8.7		8.35**
Separation from child's father ^a (%)	31.0	10.6		7.63*
<i>Contextual characteristics</i>				
Stressful life events ^a	2.5 (1.8)	2.0 (1.5)	2.43 ⁺	
<i>Child characteristics</i>				
Mean age (in months)	68.1 (2.0)	64.1 (1.6)	134.46***	
Female (%)	41.4	46.9		0.28
Birth weight (g)				2.73
<2,500	7.6	8.9		
2,500–2,999	11.5	12.5		
3,000–3,999	73.1	64.3		
4,000–4,999	7.7	14.3		

Data are given as means (SD) and tests are two-tailed unless otherwise indicated; PPD postpartum depression; ⁺ $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$; ^a one-tailed test

sample were less likely to be living with a partner (75.9% vs. 91.2%; $\chi^2 = 5.12$, $p < .05$), more likely to have conflicts with their partner (29.6% vs. 8.7%; $\chi^2 = 8.35$, $p < .01$), and more likely to be separated from the child's biological father (31.0% vs. 10.6%; $\chi^2 = 7.63$, $p < .05$) than the mothers in the community sample. In view of the potential influence of these variables on the children's developmental outcomes, these factors were added as covariates to the GLM analyses. Since 'living with a partner' and 'separation from the child's father' were highly interrelated ($r = 0.88$, $p < .001$), we only added one of these two variables as a covariate to the GLM analyses, viz. separation from the child's father, because this variable showed greater differences between the samples. We also found that the children in the PPD sample were on average 4 months older at the time of the assessment than those in the community sample ($M = 68.1$, $SD = 2.0$ vs. $M = 64.1$, $SD = 1.6$; $F = 134.46$, $p < .001$). To determine whether child age was associated with the child developmental outcomes, we examined their intercorrelations in each sample. Although no significant intercorrelations were found between child age and the developmental outcomes, we decided to control for child age in all analyses to ensure that any potential influence of this variable was controlled for.

The differences between the samples in terms of maternal education level and the number of stressful life events in the past 5 years were marginally significant, revealing trends of lower maternal educational levels ($M = 3.3$, $SD = 1.5$ vs. $M = 3.8$, $SD = 1.5$; $F = 2.38$, $p < .10$) and more stressful life events ($M = 2.5$, $SD = 1.8$ vs. $M = 2.0$, $SD = 1.5$; $F = 2.43$, $p < .10$) in the PPD sample. Since both maternal education and the number of stressful life events were significantly related to multiple child outcomes (e.g., higher maternal education was related to higher verbal intelligence and higher

ego-resiliency, and more stressful life events to lower peer social competence and higher teacher-rated externalizing problems), we decided to also control for these potential risk factors in the GLM analyses. No differences between the samples were found in terms of maternal age, the proportion of mothers having a Dutch ethnicity, the proportion of boys and girls, or the children's birth weight.

Relation Between Sample Status and Children's Developmental Outcomes

GLM analyses were used to examine the relation between sample status (PPD vs. community) and developmental outcomes, while controlling for child age, child gender and the risk factors of maternal education, presence of partner conflict, separation from the father, and number of stressful life events. We also studied the two-way interactions between sample status on the one hand and child gender, maternal education, partner conflict, separation from the father and stressful life events on the other hand. The results of the multivariate tests are presented in Table 2.

Significant multivariate main effects of sample status ($F = 2.87, p < .01, \eta_p^2 = 0.21$) and of child gender ($F = 3.88, p < .001, \eta_p^2 = 0.26$) were found on the developmental outcomes. The Sample \times Gender effect was marginally significant ($F = 1.86, p = .07, \eta_p^2 = 0.15$), as were the main effects of maternal education ($F = 1.78, p = .08, \eta_p^2 = 0.14$) and the number of stressful life events ($F = 1.88, p = .06, \eta_p^2 = 0.15$). No significant main or interaction effects were found for the other covariates.

Next, we examined the univariate effects of sample status (see Table 3) and Sample \times Gender interaction effects for the individual developmental outcomes, while controlling for child age, child gender and the risk factors of maternal education, presence of partner conflict, separation from the father, and number of stressful life events. The univariate tests revealed that children in the PPD sample had lower ego-resiliency ($F = 4.74,$

Table 2 Multivariate results of the MANCOVA predicting children's developmental outcomes from sample status and covariates

	Wilks' λ	<i>df</i>	<i>F</i>	η_p^2
<i>Main effect</i>				
Sample status	0.79	9, 98	2.87**	0.21
<i>Covariates</i>				
Child age	0.96	9, 98	0.49	0.04
Child gender	0.74	9, 98	3.88***	0.26
Maternal education	0.86	9, 98	1.78 ⁺	0.14
Partner conflict	0.92	9, 98	0.96	0.08
Separation from father	0.94	9, 98	0.68	0.06
Stressful life events	0.85	9, 98	1.88 ⁺	0.15
<i>Interaction effects</i>				
Sample \times gender	0.85	9, 98	1.86 ⁺	0.15
Sample \times education	0.95	9, 98	0.58	0.05
Sample \times conflict	0.94	9, 98	0.64	0.06
Sample \times separation	0.91	9, 98	1.02	0.09
Sample \times life events	0.89	9, 98	1.40	0.11

⁺ $p < .10$; * $p < .05$, ** $p < .01$, *** $p < .001$ (two-tailed)

Table 3 Univariate results of the differences between the two samples on children's individual developmental outcomes when controlling for covariates

	PPD sample		Community sample		<i>F</i>	η_p^2
	EM	SE	EM	SE		
Ego-resiliency	.36	0.07	0.50	0.03	4.74*	0.04
Self-esteem	3.50	0.39	4.10	0.16	2.14	0.02
Peer social competence	-1.12	0.59	0.75	0.24	9.48**	0.08
Verbal intelligence	105.73	4.48	108.24	1.87	2.64	0.02
School adjustment	3.52	0.18	3.58	0.08	4.80*	0.04
MR internalizing problems	47.48	2.61	51.80	1.09	2.18	0.02
TR internalizing problems	54.01	2.40	51.05	1.00	2.55	0.02
MR externalizing problems	45.53	2.58	55.79	1.08	8.74**	0.08
TR externalizing problems	50.35	2.56	53.56	1.07	0.72	0.01

PPD postpartum depression, EM estimated mean, SE standard error, MR mother-rated, TR teacher-rated, * $p < .05$; ** $p < .01$ (two-tailed)

$p < .05$, $\eta_p^2 = 0.04$), lower peer social competence ($F = 9.48$, $p < .01$, $\eta_p^2 = 0.08$), lower school adjustment ($F = 4.80$, $p < .05$, $\eta_p^2 = 0.04$) and lower mother-rated externalizing problems ($F = 8.74$, $p < .01$, $\eta_p^2 = 0.08$) than the children in the community sample. A significant interaction effect between sample status and gender ($F = 5.73$, $p < .05$, $\eta_p^2 = 0.05$) and separate ANCOVAs for boys and girls revealed that the sample difference in mother-rated externalizing problems was only evident in girls: daughters of PPD mothers had lower scores on mother-rated externalizing problems than daughters of mothers in the community sample ($F = 4.44$, $p < .05$, $\eta_p^2 = 0.08$), while no such difference was found for boys ($F = 0.29$, ns). Furthermore, a significant Sample \times Gender effect was found for verbal intelligence ($F = 5.87$, $p < .05$, $\eta_p^2 = 0.05$): girls in the PPD sample had lower verbal intelligence than girls in the community sample ($F = 6.50$, $p < .05$, $\eta_p^2 = 0.12$), whereas for boys, the difference between verbal intelligence in the PPD sample and in the community sample was not significant ($F = 2.25$, ns).

Discussion

This study compared early school-aged children whose mothers were depressed during the child's infancy with early school-aged children from a community sample, in terms of a comprehensive set of developmental outcomes, controlling for associated risk factors. Several adverse outcomes for children of PPD mothers were found as compared to community sample children: children whose mothers had PPD in infancy showed lower ego-resiliency, lower peer social competence and lower school adjustment. In addition, daughters of mothers who had PPD had lower verbal intelligence scores than girls in the community sample. One unexpected outcome was found among the daughters of PPD mothers, namely less mother-rated externalizing problems as compared to the children in the community sample. Risk factors associated with the occurrence of PPD, i.e., lower maternal education, more conflicts with the partner, separation from the child's biological father and more stressful life events were controlled for and therefore did not account for the relation between PPD and children's outcomes in the early school period. Furthermore, the presence of risk factors in the context of PPD did not present an extra risk to the

children whose mothers had PPD, as was evident from the lack of interaction effects between sample status and the risk factors.

Our results support findings from previous studies indicating that PPD in mothers adversely affects their children's development in several domains, and adds to the existing literature in that these adverse child outcomes remain when controlling for the risk factors associated with PPD. Children's competence to deal with stress and to interact with peers seemed particularly affected by maternal PPD in the early school period, as was evident from lower ego-resiliency, lower school adjustment, and lower peer social competence. Although ego-resiliency and school adjustment both involve the capacity to deal with stressful experiences, ego-resiliency relates to a more general personality characteristic, while school adjustment relates specifically to stress in the school setting. When children enter school, they have to deal with new demands, such as meeting academic standards, complying with the teacher's rules, and developing peer relations. Children whose mothers were postpartum depressed may have more trouble with adjusting to these new demands of the school environment. The lower competence in terms of peer relations of children of PPD mothers may further hinder this adjustment to school.

In our study, daughters, but not sons, of PPD mothers were found to show lower verbal intelligence compared to the community sample. A possible explanation for these results may be that daughters might maintain closer contact with their depressed mother than sons, making it more difficult for girls to overcome the emotional unavailability of the mother, and hence leading to more adverse developmental outcomes. When a mother shows frightening behaviour, for example, girls tend to approach her, whereas boys are more likely to show avoidance and conflict behaviour [70, 71]. From a psychoanalytic perspective, it has been assumed that girls generally have a greater need for intimacy towards their mothers and are more inclined to identify with their mothers than boys [72]. Boys, on the other hand, may be inclined to turn more towards their fathers, which may protect them from adverse outcomes, at least in the absence of paternal psychopathology [73].

While most results in this study pointed in the direction of more unfavourable developmental outcomes for children of PPD mothers, one result contradicted this pattern: daughters of mothers who had PPD were rated as less externalizing by their mothers than their counterparts in the community sample. This result can be interpreted in several ways. First, not showing externalizing behaviours may be a way for daughters of PPD mothers to adjust to the family situation by not causing any extra trouble to their mother. Girls are more prone to role reversal or parentification, which implies that the child tries to fulfil the parent's need for comfort and care [74]. Not showing externalizing behaviour might be part of such role reversal. It has been found that adolescent girls of PPD mothers are more sensitive to emotions in others than those not exposed to PPD [75]. A second possible explanation is that social desirability played a role in the way the mothers in the PPD sample rated the behaviour of their daughters. PPD mothers in particular may have wanted to give the impression that there were no problems with their daughters and that they were developing well. A reason why they may specifically have this tendency for their daughters rather than for their sons may be that externalizing behaviour is generally more accepted in boys than in girls. Paired-samples *t* tests showed that the PPD mothers reported significantly less externalizing problems for their daughters than the teachers did ($p < .05$). This mother–teacher discrepancy was not seen for sons of PPD mothers, nor for boys or girls in the community sample, which may support the effect of social desirability when PPD mothers rated the externalizing behaviour of their daughters. A third explanation for the lower levels of externalizing problems among girls in the PPD sample compared to girls in the community sample may lie in the relatively high levels of externalizing problems that

were found in the community sample. The children in the community sample were representative of the Dutch population in terms of all outcome measures except for externalizing problems: the average mother-rated as well as teacher-rated externalizing problems in this sample were higher than the Dutch average, although not within the borderline or clinical range, for as yet unidentified reasons [37]. Hence, the community sample used in this study may not have been a good comparison group for the PPD sample with respect to externalizing problems.

Although several differences were found between the children in the PPD sample and the children in the community sample, the long-term effects of PPD were not found for children's self-esteem, internalizing problems or teacher-rated externalizing problems. In Goodman et al.'s study [21] of 8- to 10-year-old children of mothers with and without a history of depression, the association between previous maternal depression and lower child self-esteem was moderated by hostile or critical views of the mother about the child. This indicates that lower self-esteem in children of PPD mothers may be restricted to certain subgroups. With regard to children's internalizing and externalizing problems, several studies have found an association between the occurrence of stressful life events and more behaviour problems in the children [76, 77]. By controlling for stressful life events in this study, potential differences between the samples may have been omitted.

Some limitations should be kept in mind when interpreting the results of this study. First, in view of the prevalence of maternal depression after childbirth [1], the community sample cannot be considered to be free of depressed mothers. Hence, the differences in child outcomes between children of postpartum depressed mothers and children of never depressed mothers may be greater. Second, the long-lasting effect of maternal PPD may be moderated by other risk factors than the ones included in our study. The effect sizes of the associations between PPD and child developmental outcomes, and the lack of interaction effects between PPD and additional risk factors in this study, indicate that there is more to the story than the predictors that we have examined or controlled for (i.e., sample status, gender, maternal education, partner conflict, separation from the father and stressful life events). For example, we were not able to examine characteristics of the mother's previous and current depression (chronicity, severity, comorbidity) or paternal characteristics as moderators in the relation between PPD and child outcomes, since this information was not available for the community sample. Previous research has shown that factors like chronicity of maternal depression [78] or comorbidity [79] can moderate long-term effects of PPD on children. Other potential moderators in the effect of maternal PPD on child development are the presence of other caregivers (such as grandparents) and of siblings, and birth order. Third, the families in the PPD sample came from different rural and urban areas than the families in the community sample, which may have influenced the demographics of the samples. Although we have controlled for the demographics on which the two samples significantly differed, we cannot exclude the possibility that the samples differed on other, unknown demographics that were influenced by the different living areas, such as family income, or different type of schools. Fourth, the sample of children of PPD mothers was small, implying that the results of this study are exploratory. Caution is thus required in the interpretation of our results. Another consequence of the restricted number of mothers in the PPD sample was that we were unable to examine whether the different manifestations of maternal depression in the postpartum period (i.e., major depressive episode, dysthymia, and heightened levels of depressive symptoms) had different effects on the children's early school outcomes.

It would be interesting in further research to examine the implications for the future of the small to medium-sized differences we found in the early school years between children

of PPD mothers and children of a community sample. Small differences in early childhood may either fade away over time or trigger a range of other consequences which may provoke larger differences between children later in life. For example, low peer social competence may cause problems in peer relations, which are related to a range of other negative outcomes, such as more aggressive behaviour [80], lower academic achievement and higher unemployment later in life [81], as well as higher levels of loneliness and depression [82].

This study is one of the few prospective studies to examine the long-term effects of PPD on developmental outcomes in the early school period. One of the strengths of our study is the long-term assessment of a wide range of developmental outcomes, which allowed us to provide a comprehensive developmental profile of children of PPD mothers at early school age. Our study has provided some evidence for a significant long-term relationship between PPD and children's early school age outcomes, especially for children's capacities to deal with stress and interact with peers.

Summary

The apparent importance of children's early experiences for their later development found in several studies suggests that negative effects of maternal PPD on child developmental outcomes may be evident years later. The present study compared early school outcomes of children whose mothers had PPD ($n = 29$) with those of children in a community sample ($n = 113$). The child developmental outcomes that were studied at early school age were: (1) ego-resiliency, (2) self-esteem, (3) peer social competence, (4) intelligence, (5) school adjustment, (6) internalizing behaviour problems and (7) externalizing behaviour problems. All analyses were performed while controlling for risk factors associated with PPD (i.e., low maternal education, conflicts with the partner, being separated from the child's biological father, and stressful life events) to rule out the possibility that a potential effect of PPD was (partially) explained by these risk factors. Moderating effects of these risk factors and child gender on the relation between sample membership and child developmental outcomes were also studied. Results revealed several adverse outcomes for children of PPD mothers as compared to community sample children: children whose mothers had PPD showed lower ego-resiliency, lower peer social competence, and lower school adjustment. In addition, daughters of mothers who had PPD had lower verbal intelligence than girls in the community sample. One of the reasons why this result was only found for girls and not for boys may be that daughters maintain closer contact with their mother when she is depressed. Remarkably, daughters of mothers who had PPD were also rated as less externalizing by their mothers than girls in the community sample. One of the interpretations of this result may be a tendency among girls of depressed mothers to show more role reversal or parentification, trying to fulfil the parent's need for comfort and care. Overall, our study provides some evidence for a significant long-term relationship between maternal PPD and children's early school age outcomes, when potential risk factors related to PPD are controlled for. Children's capacities to deal with stress and interact with peers in the early school period seem particularly affected by their mothers' PPD.

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