

Parental depression and child well-being: young children's self-reports helped addressing biases in parent reports

Ank P. Ringoot^{a,b}, Henning Tiemeier^{b,c,d,*}, Vincent W.V. Jaddoe^{a,c,e}, Pety So^{b,f},
Albert Hofman^d, Frank C. Verhulst^b, Pauline W. Jansen^{a,b,g}

^aThe Generation R Study Group, Erasmus University Medical Center, PO Box 2040, 3000 CA Rotterdam, The Netherlands

^bDepartment of Child and Adolescent Psychiatry/Psychology, Erasmus University Medical Center, PO Box 2060, room KP-2822, 3000 CB Rotterdam, The Netherlands

^cDepartment of Psychiatry, Erasmus University Medical Center, PO Box 2040, 3000 CA Rotterdam, The Netherlands

^dDepartment of Epidemiology, Erasmus University Medical Center, PO Box 2040, 3000 CA Rotterdam, The Netherlands

^eDepartment of Pediatrics, Erasmus University Medical Center, PO Box 2060, 3000 CB Rotterdam, The Netherlands

^fDepartment of Child and Adolescent Psychiatry, Riagg Rijnmond, PO Box 711, 3000 AS Rotterdam, The Netherlands

^gInstitute of Psychology, Faculty of Social Sciences, Erasmus University Rotterdam, Woudestein, T13-01, PO Box 1738, 3000 DR Rotterdam, The Netherlands

Accepted 18 March 2015; Published online 25 March 2015

Abstract

Objectives: Effects of maternal and paternal depression on child development are typically evaluated using parental reports of child problems. Yet, parental reports may be biased.

Methods: In a population-based cohort, parents reported lifetime depression ($N = 3,178$) and depressive symptoms ($N = 3,131$). Child emotional and behavioral problems were assessed at age 6 years by child self-report using the Berkeley Puppet Interview, by mother report using the Child Behavior Checklist (CBCL), and at age 3 years by father and mother reported CBCLs.

Results: Both maternal and paternal depression was associated with more child problems. Associations were of similar strength if child problems were obtained by self-reports. However, if parents reported about their own depression or depressive symptoms and about their child's problems, estimates were generally stronger for associations with the reporting parent's depression as the determinant. For instance, if mothers reported child emotional problems, associations were stronger for maternal ($B = 0.27$; 95% confidence interval (CI) = 0.19, 0.35) than for paternal lifetime depression ($B = 0.12$; 95% CI = 0.02, 0.21; P -value for difference = 0.02).

Conclusion: Depression of mothers and fathers affects young children's well-being. However, if parents reported about their own depression and about child problems, associations were inflated. To accurately estimate effects of parental depression, multiple-source data including young children's perspectives must be considered. © 2015 Elsevier Inc. All rights reserved.

Keywords: Depression; Father; Child emotional and behavioral problems; Multi-informant; Bias; Berkeley Puppet Interview

Conflict of interest: F.C.V. is a contributing author of the Achenbach System of Empirically based assessment, from which he receives remuneration. The other authors declare that they have no conflict of interest to disclose.

Funding: The first phase of the Generation R Study was made possible by financial support from Erasmus Medical Center, Rotterdam, Erasmus University Rotterdam, and the Netherlands Organization for Health Research and Development (ZonMw). The work of Professor Tiemeier is supported by NWO-ZonMw VIDI (grant no. 017.106.370).

* Corresponding author. Erasmus University Medical Center Rotterdam, Department of Child and Adolescent Psychiatry/Psychology, Room KP-2822, PO-Box 2060, 3000 CB Rotterdam, The Netherlands. Tel.: (31) 10-7043489; fax: (31) 10-7044657.

E-mail address: h.tiemeier@erasmusmc.nl (H. Tiemeier).

<http://dx.doi.org/10.1016/j.jclinepi.2015.03.009>

0895-4356/© 2015 Elsevier Inc. All rights reserved.

1. Introduction

Parental depression places children at risk for a range of adverse outcomes including substance dependence, social problems, and poor physical health later in life [1,2]. Although the risk that maternal depression poses for offspring's unhealthy development has often been studied [3], the effect of paternal depression has only recently received more attention [4]. As fathers not only pass on their genes, but are increasingly involved in care-giving activities [5], it is important to examine the impact of both maternal and paternal depression on children's development. This is particularly important in early childhood, as the first years of life are critical for the cognitive, physical,

What is new?**Key findings**

- If parents report both about their depression and their child's problems, this will likely bias observed associations. To further accurate assessment of the effects of parental depression on child problem behavior, additional informants next to the parents are needed.

What this adds to what was known?

- Parental depression places children at risk for adverse outcomes. Yet, evidence of the specific effect of paternal as compared with maternal depression on young children's well-being is relatively scarce and mainly based on parental reports of child problems, although reports of parents may be biased.
- We used depression data from a large population-based cohort and obtained maternal, paternal, and young child self-reported information of children's problem behavior.
- This study showed that maternal and paternal depression similarly affected young children's well-being. However, if parents reported on both their own depression and on child problems, associations were inflated, suggesting that shared-method variance influenced findings.

What is the implication and what should change now?

- Results highlight that future studies of parental depression would benefit from considering additional information to parents' perspectives. Young children's self-reports can help address potential bias in parent reports.

and emotional development of children. Children rely heavily on their parents in the preschool period, as they are children's primary environment.

Evidence of the specific impact of fathers' depression compared with mothers' depression is relatively scarce. Moreover, our knowledge about the effect of maternal and paternal depression on offspring development in early life is mainly based on parent—mostly mother—reports of child problems [6–10]. This potentially limits conclusions of such studies: if the same source is used to provide information on both determinant and outcome, associations may be inflated due to shared-method variance [11]. In the case that the same informant reports both on the determinant and the outcome, some portion of the variance between the determinant and the outcome is likely to be

shared as result of specific characteristics of the informant (eg, the informants' perspective on the world, test taking attitudes) rather than as a result of the construct of interest [12]. Moreover, depressed parents may overestimate their children's problems [13].

Only a few studies on the impact of maternal and paternal depression complemented parent reports of young children's problems with information from other sources, like teachers [14–16]. However, these studies generally used mean scores or generated combined diagnoses, thus diagnosing a problem if it was present according to either one of the informants. As a result, bias by parental report could not be ruled out.

In current literature, one potential source of information is largely ignored: the child's own perspective on his or her problems. To the best of our knowledge, child report has not been used as a source when examining the association between parental depression and young children's problem behavior. The offspring's perspective on well-being has only been considered in studies assessing the effect of parental psychopathology among adolescents. Interestingly, some of these studies showed that fathers' depressive symptoms during the adolescent period were more strongly associated with emotional and behavioral problems than mothers' depressive symptoms [17,18]. In contrast, weaker associations of paternal rather than maternal perinatal depression with adolescent self-reported outcomes have been observed [19], suggesting that early in life the impact of maternal depression may be larger [1].

Unfortunately, similar studies using young children's own reports of their problems to compare the impact of maternal and paternal depression are not available. Obtaining self-reports of problems in children under the age of 8 years has been considered challenging given the relative lack of appropriate instruments. However, studies have shown that by using an age-appropriate method, 5- to 7-year old children from diverse sociodemographical backgrounds can provide valuable information on their problems [20–23].

The present study compared the association of paternal and maternal depression with emotional and behavioral problems of 3- to 6-year-old children using father, mother, and self-reports of child problems. We hypothesize that by using information about child problem behavior from more than one informant, a more accurate picture of the effect of parental depression is obtained than by relying on mother or father reports of child problems only. Given results from previous studies [1], we also hypothesized that fathers' depression has an adverse but smaller effect on child problems than mothers' depression. To examine consistency of associations throughout different phases in young children's development, we studied lifetime depression before childbirth and parental depressive symptoms when the child was 3 years of age.

2. Methods

2.1. Design and study population

This study was performed within Generation R, a population-based prospective cohort from fetal life onward in Rotterdam, the Netherlands [24]. The study was approved by the Medical Ethics Committee at Erasmus University Medical Center Rotterdam. Written informed consent was obtained from all caregivers.

The analyses for this study were performed in two subsamples from the Generation R Study. The first subsample was defined by families with complete information on maternal and paternal lifetime depression, assessed prenatally ($n = 4,545$). Analyses were performed using mother and father reported child outcomes at age 3 years and using mother and child self-reported outcomes at age 6 years. Of the 4,545 participants with maternal and paternal prenatally assessed lifetime depression data, 3,582 participants had outcome data at either age 3 or 6 years. Of these, 2,573 participants had data on mother and father reported child outcomes at age 3 years, and 3,178 participants had data on mother and child reported child outcomes at age 6 years (flowchart in [Supplementary Material, Fig. S1](#) at www.jclinepi.com). The second subsample was defined by the availability of maternal and paternal reports of depressive symptoms, assessed at child age 3 years ($n = 3,718$). Again, analyses were performed with child outcomes at child age 3 years and child age 6 years. Of the 3,718 participants with maternal and paternal depressive symptom data assessed at child age 3 years, 3,660 participants had data on mother and father reported child outcomes at age 3 years, and 3,131 participants had data on mother and child reported child outcomes at age 6 years ([Supplementary Material, Fig. S2](#) at www.jclinepi.com).

The overlap between the two subsamples was 2,091 (ie, all determinants and outcome data at age 6 years), thus 1,087 participants were included in the first but not in the second subsample. These participants were of more disadvantaged socioeconomic background (see nonresponse analyses).

2.1.1. Nonresponse analyses

Two nonresponse analyses were performed. The first compares participants included in both subsamples ($n = 2,091$) with participants in either one of the two subsamples ($n = 1,087$). The second is a loss to follow-up analysis, comparing participants included in the analyses of prenatal depression and child outcomes at age 6 years ($n = 3,178$) with participants who had baseline data but were lost to follow-up [$n = 1,367$ ($4,545 - 3,178$)].

The first nonresponse analysis indicated that participants included in just one of the two subsamples ($n = 1,087$) had more often younger mothers [$M_1 = 29.7$; standard deviation (SD) $_1 = 4.9$; $M_2 = 31.8$; $SD_2 = 3.9$; $t(1,824) = -11.95$; $P < 0.001$], were more often of non-

Western origin (35% non-Western vs. 13% non-Western; $\chi^2(1) = 209$; $P < 0.001$), came from families with a lower (<2,000 € net monthly) household income (38% vs. 15%; $\chi^2(1) = 185$; $P < 0.001$), and a lower level (primary or secondary) of parental education (maternal: 59% vs. 33%; $\chi^2(1) = 192$; $P < 0.001$; paternal: 60% vs. 37%; $\chi^2(1) = 150$; $P < 0.001$), than participants included in both subsamples ($n = 2,091$).

The second analysis of nonresponse indicated that participants who were lost to follow-up ($n = 1,367$) had more often younger mothers ($M_1 = 29.1$; $SD_1 = 5.2$; $M_2 = 31.1$; $SD_2 = 4.4$; $t(2,239) = -12.46$; $P < 0.001$), were more often of non-Western origin (32% non-Western vs. 20% non-Western; $\chi^2(1) = 72$; $P < 0.001$), came from families with a lower (<2,000 € net monthly) household income (38% vs. 22%; $\chi^2(1) = 106$; $P < 0.001$), and a lower level (primary or secondary) of parental education (maternal: 57% vs. 42%; $\chi^2(1) = 80$; $P < 0.001$; paternal: 57% vs. 45%; $\chi^2(1) = 54$; $P < 0.001$), than participants included in the analyses ($n = 3,178$).

2.2. Parental depression

Lifetime depression was assessed before childbirth at 20 weeks of pregnancy using self-report questionnaires filled out by mothers and fathers separately. At the time of responding, 94.4% of the parents lived in the same household. Parents indicated whether they had ever suffered from psychiatric disorders. For each disorder, an example was provided, followed by several items. We used the item on lifetime depression. To validate our measure of self-reported lifetime depression, we compared these reports to a diagnosis of lifetime depression obtained with the Composite International Diagnostic Interview (CIDI) [25], in a subsample from the overall cohort. The use of the CIDI in the Generation R Study has previously been described in more detail [26]. Self-reported lifetime depression had a sensitivity of 80% and a specificity of 80% for mothers ($n = 615$) and a sensitivity of 70% and specificity of 87% for fathers ($n = 584$).

Prevalent depressive symptoms of mothers and fathers at child age 3 years were assessed with the Dutch version of the Brief Symptom Inventory (BSI), a validated self-report questionnaire, which is widely used in clinical and research settings [27]. Based on self-reported information, 99% of the fathers were the biological father of the child. The original BSI consists of 53 items, scored on a five-point scale, ranging from 0 to 4. The items assess psychiatric symptoms occurring in the preceding 7 days. We calculated a mean score on the six-item depression scale ($\alpha = 0.80$ for both mothers and fathers).

2.3. Children's emotional and behavioral problems

Child self-reported emotional and behavioral problems were obtained with the Berkeley Puppet Interview (BPI)

[28]. This interview was assessed at our research center when children were on average 6 years old. During the interview, two identical dog hand puppets made opposing statements about themselves and asked children to indicate which statement described him/her best. Each statement was scored on a seven-point scale, with higher scores representing more problems. Items were summed to compute scale scores. We used the 20-item internalizing (ie, emotional problems, $\alpha = 0.70$) and 21-item externalizing (ie, behavioral problems, $\alpha = 0.76$) scales. Within this cohort, we recently demonstrated that 5- to 7-year old children are capable of providing valid and specific information using the BPI [23].

Parent reported child emotional and behavioral problems were assessed with the Child Behavior Checklist 1.5–5 (CBCL) [29], when children were 3 years ($SD = 0.10$) and 6 years old ($SD = 0.35$). At child age 3 years, mothers and fathers each completed the CBCL. At child age 6 years, the primary caregiver (92% mothers) completed the questionnaire at home, before the research center visit. We will refer to this report as “mother report at 6 years.” Parents rated the occurrence of their children’s behavior within the past 2 months on a three-point scale. Items were summed to compute scale scores, higher scores represented more problems. We used the 36-item internalizing (emotional problems) and 24-item externalizing (behavioral problems) scales. Good reliability and validity have been reported for the CBCL [29]. Internal consistencies ranged between 0.79 and 0.89.

2.4. Covariates

Several potential covariates were considered. Information on parents age at intake and child gender was obtained from medical records. Smoking and alcohol use during pregnancy were assessed by questionnaires during pregnancy. Information on number of children in the household, child national origin, parental educational level, marital status, and family income were obtained by a questionnaire before the research center visit. The child’s national origin was based on the countries of birth of both parents [30]. Marital status was divided into two categories, indicating whether mothers lived with or without a partner. During the research center visit, child age was recorded and children’s verbal abilities were assessed using a receptive language subtest (syntax choice task) of a Dutch test battery [31].

2.5. Data analysis

The relation between parental depression and child problems was first analyzed using prenatally assessed parental lifetime depression as the determinant and then with continuous parental depressive symptoms at child age 3 years as the determinant. Analyses were conducted separately for paternal and maternal depression. Children’s emotional or behavioral problems were studied as continuous outcomes.

Analyses were first performed with child outcome data at child age 6 years (child and mother report of child problems using the BPI and CBCL, respectively) and repeated with outcome data at child age 3 years (mother and father report of child problems using the CBCL). To approach a normal distribution of the outcome data, BPI and CBCL scale scores were transformed using inverse and square root transformations. To facilitate effect size comparison, z -scores were calculated for outcomes and continuous determinants.

First, we examined the relationship between parental depression and child problems using mixed models for multiple-source data [32]. The outcome was child problems reported by two persons, either child (BPI) and mother (CBCL) at child age 6 years or mother and father (both CBCL) at child age 3 years. In these mixed models (PROC MIXED in SAS 9.3), the outcome was treated as repeated construct. We formally examined whether the strength of associations between parental depression and child problems depended on the informant of the outcome by including an interaction term between informant (child vs. mother or mother vs. father) and parental depression in the models.

Second, if associations depended on the reporter of the outcome (ie, a significant interaction in the mixed models), we performed linear regression analyses with parental depression as determinant and used mother and self-report of child problems at child age 6 years or mother and father reports at child age 3 years as separate outcomes. We used a z -test to examine the difference in estimates of father vs. mother depression. Regressions were controlled for covariates if they changed the estimates of the unadjusted association by more than 5%. In a next step, to control for any confounding due to depression of the other parent, analyses were controlled for depression of the other parent (in 6.4% of the couples, lifetime depression was present in mothers and fathers; the correlation between maternal and paternal depressive symptoms was $r = 0.25$). Because analyses were performed in separate subsamples, in additional analyses we repeated the linear regression analyses in participants with complete data.

Third, to illustrate the contribution of parents’ depression to child problems, we plotted the estimates of having either a father, a mother, or two parents with lifetime depression. Analyses of covariance (ANCOVAs) were performed with a categorical indicator of the number of affected parents as a determinant of BPI and CBCL scores, as separate outcomes.

Multiple imputation was used to account for missing values in covariates. Missing values ranged from $< 0.01\%$ for gender to 14% for child verbal abilities (mean percentage missing data on covariates: 4.8%). Missing data on the CBCL at age 6 years was imputed if CBCL data at either 1.5 or 3 years was available. Coefficients were averaged over 20 imputed data sets. Regression analyses, ANCOVAs, and multiple imputation were performed using SPSS version 20.0 (IBM Corp: Armonk, NY).

Table 1. Participant characteristics in original data

| Participant characteristics | Subsample with data on prenatal lifetime depression and child problems (N = 3,178) | | Subsample with data on depressive symptoms at child age 3 yr and child problems (N = 3,131) | |
|--|--|------------------------|---|--------------------------------|
| | N | Mean (SD) ^a | N | Mean (SD) ^a |
| Parental characteristics | | | | |
| Paternal age at intake, yr | 3,177 | 33.5 (5.32) | 2,527 | 34.1 (5.00) |
| Maternal age at intake, yr | 3,178 | 31.1 (4.41) | 3,131 | 32.0 (4.20) |
| Education father (% lower) | 2,892 | 35.2 | 2,936 | 30.5 |
| Education mother (% lower) | 3,170 | 36.6 | 3,124 | 30.3 |
| Marital status (% living without partner) | 3,008 | 8.8 | 2,995 | 5.7 |
| Household income (%) | 2,864 | | 2,884 | |
| <2,000 | | 14.9 | | 9.8 |
| 2,000–4,000 | | 44.8 | | 44.0 |
| >4,000 | | 40.3 | | 46.2 |
| Alcohol use throughout pregnancy (% any) | 2,905 | 47.6 | 2,531 | 52.1 |
| Smoking during pregnancy (% continued) | 2,924 | 13.2 | 2,849 | 10.6 |
| Lifetime depression prenatally (% yes) | | | | |
| Father | 3,178 | 16.0 (n = 510) | — | — |
| Mother | 3,178 | 27.8 (n = 884) | — | — |
| Depressive symptoms at age 3 yr (BSI scores) | | | | |
| Father [median (90 percentile range)] | — | — | 3,131 | 0.11 (0.27) [0.00(0.00, 0.50)] |
| Mother [median (90 percentile range)] | — | — | 3,131 | 0.09 (0.26) [0.00(0.00, 0.50)] |
| Child characteristics | | | | |
| Gender (% boys) | 3,178 | 48.6 | 3,131 | 49.4 |
| Siblings (% yes) | 2,957 | 83.1 | 2,969 | 84.8 |
| Age at BPI assessment, yr | 3,178 | 6.1 (0.35) | 3,131 | 6.0 (0.29) |
| National origin (%) | | | | |
| Non-Western | | 20.2 | | 15.8 |
| Other Western | | 9.0 | | 9.2 |
| Dutch | | 70.8 | | 75.0 |
| Verbal ability score | 2,736 | 22.4 (2.81) | 2,682 | 22.4 (2.76) |
| Child reported problems (BPI 6 yr) | | | | |
| Emotional problems score | 3,178 | 58.2 (11.97) | 3,131 | 57.1 (11.43) |
| Behavioral problems score | 3,168 | 51.8 (10.27) | 3,121 | 51.4 (10.05) |
| Mother reported child problems (CBCL 6 yr) | | | | |
| Emotional problems score | 3,009 | 5.5 (5.39) | 3,005 | 5.1 (4.97) |
| Behavioral problems score | 3,018 | 7.0 (6.19) | 3,008 | 6.7 (5.96) |

Abbreviations: SD, standard deviation; BSI, Brief Symptom Inventory; BPI, Berkeley Puppet Interview; CBCL, Child Behavior Checklist.

Note: Values represent original, nonimputed data.

^a Presented are mean and standard deviation, unless otherwise indicated.

3. Results

Characteristics of the study population are presented in Table 1. The mean parental depression scores at child age 3 years in this sample were lower [0.11 for mothers (SD = 0.27); 0.09 for fathers (SD = 0.26)] than in a Dutch norm population [27]. In this sample, 8% of mothers and 11% of fathers scored above average. About half of the children were boys, and about 70% were of Dutch national origin. Correlations between child and parent reported emotional and behavioral problems at 6 years were 0.13 and 0.18, respectively. Correlations between maternal and paternal report of child problems at 3 years were 0.48 for emotional and 0.53 for behavioral problems.

Mixed-model analyses showed several interactions between parents' depression and the informant of child problems, indicating that the size and direction of associations between parental depression and child problems depended on whether children, mothers, or fathers reported child

problems (see Supplementary Material, Table S1 at www.jclinepi.com). Because associations depended on the informant, in the next analyses we examined associations between parental depression and child problems for each informant (child, mother, and father) separately.

3.1. Parental lifetime depression assessed prenatally and child problems at two time points

Table 2 shows that if emotional and behavioral problems were reported by 6-year-old children, lifetime depression of fathers and mothers was associated with child emotional problems (father $B = 0.13$; $P < 0.01$; mother $B = 0.12$; $P < 0.01$). Only fathers', but not mothers', lifetime depression was associated with child reported behavioral problems (father $B = 0.16$; $P < 0.01$; mother $B = 0.06$; $P = 0.11$). If mothers reported the problems of their 6-year-old children, results differed from those obtained using child self-reports.

Table 2. Parental prenatal lifetime depression and child problems

| Lifetime depression, prenatally (dichotomous) | Child age 6 yr | | | | Child age 3 yr | | | |
|--|--|--------------|-----------------------------------|----------------------|--|----------------------|-----------------------------------|----------------------|
| | Child report (BPI) ^a | | Mother report (CBCL) ^a | | Father report (CBCL) ^a | | Mother report (CBCL) ^a | |
| | <i>B</i> | 95% CI | <i>B</i> | 95% CI | <i>B</i> | 95% CI | <i>B</i> | 95% CI |
| | Emotional problems score <i>N</i> = 3,178 | | | | Emotional problems score <i>N</i> = 2,573 | | | |
| Father | 0.13 | 0.03, 0.22** | 0.12 ^b | 0.02, 0.21* | 0.25 | 0.14, 0.35*** | 0.14 | 0.04, 0.25** |
| Mother | 0.12 | 0.04, 0.19** | 0.27^b | 0.19, 0.35*** | 0.17 | 0.09, 0.26*** | 0.25 | 0.16, 0.33*** |
| | Behavioral problems score <i>N</i> = 3,168 | | | | Behavioral problems score <i>N</i> = 2,573 | | | |
| Father | 0.16 | 0.06, 0.25** | 0.14 | 0.05, 0.24** | 0.24 | 0.13, 0.34*** | 0.18 | 0.07, 0.28** |
| Mother | 0.06 | -0.01, 0.14 | 0.23 | 0.15, 0.31*** | 0.17 | 0.08, 0.26*** | 0.20 | 0.11, 0.28*** |

Abbreviations: BPI, Berkeley Puppet Interview; CBCL, Child Behavior Checklist; CI, confidence interval.

Note: Models adjusted for: parental age, income, marital status, maternal educational level, smoking during pregnancy, child national origin, child gender, child age, number of siblings, and verbal abilities of the child.

Bold and italicized items indicate estimates where determinant and outcome were reported by the same informant.

P* < 0.05, *P* < 0.01, ****P* < 0.001.

^a BPI scores inverse transformed, CBCL scores square root transformed. All z-scores.

^b Significant difference in estimates for paternal and maternal depression.

The associations of fathers' depression with children's problems were smaller than associations of mothers' depression with child problems (eg, emotional problems: father *B* = 0.12; *P* < 0.05; mother *B* = 0.27; *P* < 0.001). Additional *z*-tests demonstrated that when child problems were reported by the mother, the difference between maternal and paternal depression reached significance for emotional, but not for behavioral, problems (*P*-values for difference 0.02 and 0.16, respectively). Thus, mothers' depression was more strongly associated with child problems than fathers' depression if mothers reported on child problems, but this difference was not present if children self-reported their problems. A similar, but nonstatistically significant, difference was observed when father and mother reported child problems at child age 3 years were assessed as the outcome: fathers' lifetime depression was more strongly associated with child problems than mothers' lifetime depression if fathers reported on both their own depression and on child problems, and vice versa. Estimates that are potentially affected by bias are indicated in Table 2.

3.2. Parental depressive symptoms at child age 3 years and child problems at two time points

Table 3 shows that maternal and paternal depressive symptoms at child age 3 years were associated with child emotional (according to parental reports) and behavioral problems (according to all informants).

Similar to the effects of parental lifetime depression, if emotional and behavioral problems were reported by 6-year-old children, effects of fathers' vs. mothers' depressive symptoms on child problems were of a similar strength (eg, behavioral problems: father *B* = 0.04; *P* < 0.05; mother *B* = 0.05; *P* < 0.01).

In contrast, if child problems were reported by the mother, observed effects of paternal depressive symptoms were weaker than those of maternal depressive symptoms (eg, behavioral problems at age 6 years: father *B* = 0.11; *P* < 0.001; mother *B* = 0.16; *P* < 0.001). In contrast, analyses with parental reports at child age 3 years showed that fathers' depressive symptoms were more strongly related to child problems if these were also reported by fathers.

Table 3. Parental depressive symptoms at child age 3 yr and child problems

| Depressive symptoms score, 3 yr ^b | Child age 6 yr | | | | Child age 3 yr | | | |
|--|--|--------------|-----------------------------------|----------------------|--|----------------------|-----------------------------------|----------------------|
| | Child report (BPI) ^a | | Mother report (CBCL) ^a | | Father report (CBCL) ^a | | Mother report (CBCL) ^a | |
| | <i>B</i> | 95% CI | <i>B</i> | 95% CI | <i>B</i> | 95% CI | <i>B</i> | 95% CI |
| | Emotional problems score <i>N</i> = 3,131 | | | | Emotional problems score <i>N</i> = 3,660 | | | |
| Father | 0.02 | -0.02, 0.06 | 0.10 ^c | 0.07, 0.14*** | 0.21^c | 0.18, 0.25*** | 0.11 ^c | 0.07, 0.14*** |
| Mother | 0.03 | -0.01, 0.06 | 0.18^c | 0.15, 0.22*** | 0.14 ^c | 0.10, 0.17*** | 0.20^c | 0.17, 0.24*** |
| | Behavioral problems score <i>N</i> = 3,121 | | | | Behavioral problems score <i>N</i> = 3,660 | | | |
| Father | 0.04 | 0.01, 0.08* | 0.11 ^c | 0.07, 0.15*** | 0.19^c | 0.16, 0.23*** | 0.12 ^c | 0.08, 0.15*** |
| Mother | 0.05 | 0.01, 0.08** | 0.16^c | 0.13, 0.20*** | 0.12 ^c | 0.08, 0.15*** | 0.19^c | 0.15, 0.22*** |

Abbreviations: BPI, Berkeley Puppet Interview; CBCL, Child Behavior Checklist; CI, confidence interval.

Note: Models adjusted for: parental age, income, marital status, maternal educational level, smoking during pregnancy, child national origin, child gender, child age, number of siblings, and verbal abilities of the child.

Bold and italicized items indicate estimates where determinant and outcome were reported by the same informant.

P* < 0.05, *P* < 0.01, ****P* < 0.001.

^a BPI scores inverse transformed, CBCL scores square root transformed. All z-scores.

^b Square root transformed, z-scores.

^c Significant difference in estimates for paternal and maternal depressive symptoms.

Differences in estimates between associations of maternal and paternal depression with child outcomes were all significant (P -values for difference <0.05).

We reran all analyses additionally adjusting for depression of the other parent. This attenuated results: the association of fathers' depression and mother reported child emotional problems and the association of fathers' depressive symptoms and child reported behavioral problems were no longer statistically significant.

In addition, analyses were repeated in participants with complete data (ie, $n = 2,091$; [Supplementary Material, Tables S2 and S3](#) at www.jclinepi.com). The results were similar to those presented in [Tables 2 and 3](#).

We also conducted these analyses using the nonimputed data only. Results were essentially unchanged: that is, none of the differences in effect estimates between the analyses in nonimputed and imputed data were statistically significant.

3.3. Cumulative effect of parental lifetime depression prenatally assessed on child problems at age 6 years

Finally, we graphically represented the contribution of each parents' prenatally assessed lifetime depression to child problems at age 6 years. [Fig. 1A](#) shows that if both parents experienced depression, children reported more

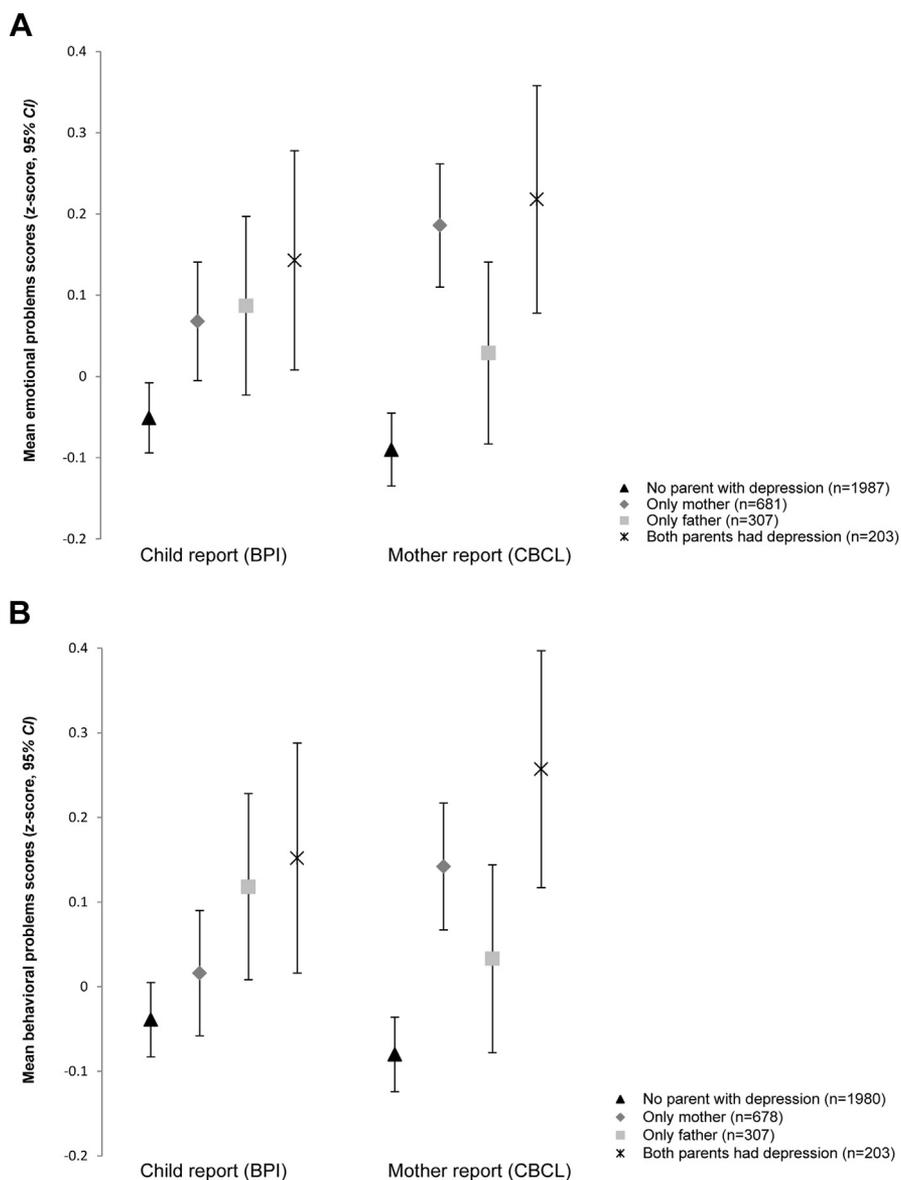


Fig. 1. Maternal vs. paternal lifetime depression prenatally assessed and child problems at age 6 years. A. Emotional problems. B. Behavioral problems. Note: Estimates are means plus confidence intervals derived from ANCOVAs. Models adjusted for: parental age, income, marital status, maternal educational level, smoking during pregnancy, child national origin, child gender, child age, number of sibling, and verbal abilities of the child. CI, confidence interval; BPI, Berkeley Puppet Interview; CBCL, Child Behavior Checklist.

emotional problems. Importantly, the figure also clearly depicts that using mother reports of child problems gives different results: effects of maternal lifetime depression and of depression in two parents were larger than effects of fathers' depression only. Results for behavioral problems show a similar pattern (Fig. 1B).

4. Discussion

The present study showed that depression of mothers and of fathers is related to emotional and behavioral problems in 3- to 6-year-old offspring. However, whether associations of paternal and maternal depression with child problems were similar, largely depended on the person reporting children's problems. When relying on children's self-reports of their problems, fathers' depression appeared to contribute to young children's problem behavior as much as mothers' depression. Although if mothers or fathers reported on children's problems, the observed association of the respective parents' depression with child problems seemed inflated.

All informants agreed that both maternal and paternal depression impacted child behavior. Yet, results based on mother reported child problems suggest that fathers' depression has less impact on child well-being than mothers' depression. This is in line with our hypothesis, and similar findings have been reported previously [1,8,10]. However, when fathers reported child problems, we observed that the opposite should be concluded. Moreover, our results based on children's own reports showed another picture: associations of paternal and maternal depression with child problems appeared very similar.

Different explanations for this inconsistency in findings are possible. Primarily, it suggests that associations between one parents' depression and the same parents' report of child problems are inflated and reflect a bias. Importantly, this inflation was not specific for mother reported child problems: it was also present for father reports of child problems. Estimates were in some instances twice as large if parent reports were used to study the impact of a parent's own depression. This most probably resulted from shared-method variance, occurring if the same informant is used to report on determinant and outcome [11]. Also, information-processing theories suggest that depressed individuals tend to interpret their experiences negatively [33], which can influence reports of depressed parents. Yet, parental depression was not measured concurrently with child problems at age 6 years. Parents with a history of depression did not necessarily experience high levels of depressive symptoms while reporting child problems at age 6 years.

The inconsistency between parent and child reports may also indicate that children are invalid reporters of their problems. The correlation between parental and child report was for example only modest. A child's

developmental level, including short attention span, limited vocabulary, and difficulties to report on complex constructs, is an inherent challenge to obtaining valid self-reports of young children [22,34]. However, if this was an issue, one would not expect to find very similar associations for paternal and maternal depression using child report, as well as very similar associations of paternal lifetime depression with child problems reported by the mother and the child him or herself. This suggests that fathers' depression may impact on young children's emotional and behavioral development as much as mothers' depression.

Each informant's report certainly has its own limitations. This is not only true in the present study but has been found across studies examining diverse health-related outcomes such as child reported exposure to secondhand smoke and child and parent report of children's quality of life [35,36]. Including children's information in addition to parent reports has shown to result in better estimates of an outcome (eg, [21,35]). Likewise, our results suggest that a more accurate picture of the effect of parental depression on child well-being can be obtained by comparing information from multiple sources. Moreover, the use of young child self-reports may provide researchers and practitioners with a surprisingly simple tool to circumvent the problem of shared informant bias if only parental reports are used.

In this study, we examined outcomes at child age 3 years and child age 6 years. Because children are thought to become capable of reporting reliably about their emotions and behavior from about the age of about 4 years onward [34], we used child report of problem behavior at child age 6 years but not at child age 3 years. Instead, we used father reports of child problems at child age 3 years to contrast results between informants. Mothers reported the outcome at both time points with the same instrument and results across the two time points were surprisingly consistent, although children's emotional and behavioral problems are not necessarily stable across 3 years' time. Studies have reported that levels of behavioral problems tend to decrease in early childhood [37]. For instance, aggressive behavior and temper tantrums of young children are transient in nature and decrease with age and developing self-regulation abilities. Internalizing problems, on the other hand, seem to increase throughout young childhood [37]. This can be explained by the difficulties in young children have communicating their emotions and with the covert nature of internalizing problems. Despite potential changes in children's problems and changes in the presentation of these problems over time, the conclusions of the present study are similar across the two time points we examined.

Several explanations may underlie the negative effects of maternal and paternal depression on offspring well-being, including a genetically transmitted risk [38–40], the impact of depression on parenting practices [41], and hazardous influences of depression on family interactions [42]. Despite associations of similar strength, dissimilar

mechanisms may also account for the negative impact of maternal and paternal depression. Specific for maternal depression may be an intrauterine effect of depression during pregnancy on fetal neurodevelopment [3]. Children may also be more exposed to maternal depression, as mothers mostly spend more time with their children than fathers. Potential explanations relating fathers' depression to child problems lie in the role fathers play in children's upbringing. Fathers are thought to encourage autonomy and self-control through play (ie, rough-and-tumble play), which may prevent the development of aggressive behavior and anxiety for new situations [43]. Because fathers' depression affects parental play behaviors [44,45], this may contribute to child problems. In addition, depressive symptoms in men can elicit feelings like anger and irritability [46], which may mediate the pathway between fathers' distress and child problems [47].

The present study has considerable strengths, including the large sample size allowing for adjustment of a range of potential confounders, the inclusion of young children's self-reports of problems, and the prospective data assessment, which reduced the likelihood of reversed causality. Nevertheless, several issues need to be discussed. First, obtaining a formal psychiatric diagnosis of lifetime depression in our large sample was not feasible. However, comparisons with CIDI diagnoses in a subsample indicated that our assessment of lifetime depression had high sensitivity and specificity. Second, the nonresponse analysis indicated selective nonresponse. Participants included in the analyses had a higher socioeconomic status and were more often of Dutch national origin than persons who were lost to follow-up. Analyses were based on a selected group of families in which both mothers and fathers completed questionnaires at multiple time points. It is possible that parents with severe depressive symptoms did not participate at baseline or dropped out of the study. This may have influenced the representativeness of our study. Moreover, participants with data on all time points came from more advantageous backgrounds. Nevertheless, our results were similar in participants with data at either one of the time points and participants with data at all time points. This is in line with a results from a study by Wolke et al. [48] who suggest that selective participation in cohort studies particularly constitutes a problem for estimating prevalence but less likely biases the associations between variables. In addition, our results suggest that even in the more advantageous families, parental depression affects child well-being and that reporter bias may also influence studies with informants from a more advantageous background. Third, effect estimates were small, which is likely inherent to our predominantly healthy study sample. Also, the average level of postnatal depressive symptoms was lower in our study than in a Dutch norm sample, which may have contributed to a relatively small effect on child problems. Yet, small but significant overall associations in a large nonclinical sample may well represent larger associations at the individual

level, particularly in the presence of clinical depression. Finally, most partners (99%) who filled out the questionnaire were the biological father of the children. In addition, more than 90% of the mothers lived together with a partner at outcome assessment. However, no data were available indicating whether mother's partner was indeed the biological father of the child at the time of outcome assessment. We adjusted analyses for living arrangement (ie, did mother live together with a partner), but if the father filling out the questionnaire was not the partner living in the same family with the child, this may have resulted in an underestimation of the associations.

The present study demonstrates that both paternal and maternal depression are similarly associated with children's emotional and behavioral problems. Our findings also implicate that researchers and clinicians examining the impact of parental depression should thoroughly consider who is asked as an informant on child problems. Shared-method variance may have driven findings of previous studies, which suggested that maternal depression affects child well-being more than paternal depression. To accurately estimate the effect of parental depression in research and in clinical practice, information should ideally not be obtained from parents only. Rather, data from multiple sources should be considered, including young children's own valuable perspective on their problems.

Acknowledgments

The Generation R Study is conducted by the Erasmus Medical Center in collaboration with the Erasmus University Rotterdam, School of Law and Faculty of Social Sciences; the Municipal Health Service Rotterdam area; the Rotterdam Homecare Foundation; and the Stichting Trombosedienst & Artsenlaboratorium Rijnmond (STAR), Rotterdam. The authors gratefully acknowledge the contribution of general practitioners, hospitals, midwives, and pharmacies in Rotterdam. The present study was performed in close collaboration with the department of child and adolescent psychiatry of Riagg Rijnmond.

Supplementary data

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.jclinepi.2015.03.009>.

References

- [1] Connell AM, Goodman SH. The association between psychopathology in fathers versus mothers and children's internalizing and externalizing behavior problems: a meta-analysis. *Psychol Bull* 2002;128:746–73.
- [2] Weissman M, Wickramaratne P, Nomura Y, Warner V, Pilowsky D, Verdelli H. Offspring of depressed parents: 20 years later. *Am J Psychiatry* 2006;163:1001–8.

- [3] Goodman SH, Gotlib IH. Risk for psychopathology in the children of depressed mothers: a developmental model for understanding mechanisms of transmission. *Psychol Rev* 1999;106:458–90.
- [4] Ramchandani P, Psychogiou L. Paternal psychiatric disorders and children's psychosocial development. *Lancet* 2009;374:646–53.
- [5] Cabrera N, Tamis-LeMonda CS, Bradley RH, Hofferth S, Lamb ME. Fatherhood in the twenty-first century. *Child Dev* 2000;71:127–36.
- [6] Kvalevaag AL, Ramchandani PG, Hove O, Assmus J, Eberhard-Gran M, Biringer E. Paternal mental health and socioemotional and behavioral development in their children. *Pediatrics* 2013;131:e463–9.
- [7] Ramchandani P, Stein A, Evans J, O'Connor TG. Paternal depression in the postnatal period and child development: a prospective population study. *Lancet* 2005;365:2201–5.
- [8] Weitzman M, Rosenthal DG, Liu YH. Paternal depressive symptoms and child behavioral or emotional problems in the United States. *Pediatr* 2011;128:1126–34.
- [9] Velders FP, Dieleman G, Henrichs J, Jaddoe VW, Hofman A, Verhulst FC, et al. Prenatal and postnatal psychological symptoms of parents and family functioning: the impact on child emotional and behavioural problems. *Eur Child Adolesc Psychiatry* 2011;20:341–50.
- [10] Malmberg LE, Flouri E. The comparison and interdependence of maternal and paternal influences on young children's behavior and resilience. *J Clin Child Adolesc Psychol* 2011;40:434–44.
- [11] Collishaw S, Goodman R, Ford T, Rabe-Hesketh S, Pickles A. How far are associations between child, family and community factors and child psychopathology informant-specific and informant-general? *J Child Psychol Psychiatry* 2009;50:571–80.
- [12] LaGrange B, Cole DA. An expansion of the trait-state-occasion model: accounting for shared method variance. *Struct Equ Modeling* 2008;15:241–71.
- [13] Richters JE. Depressed mothers as informants about their children: a critical review of the evidence for distortion. *Psychol Bull* 1992;112:485–99.
- [14] Gere MK, Hagen KA, Villabø MA, Arnberg K, Neumer S-P, Torgersen S. Fathers' mental health as a protective factor in the relationship between maternal and child depressive symptoms. *Depress Anxiety* 2013;30:31–8.
- [15] Ramchandani P, O'Connor T, Evans J, Heron J, Murray L, Stein A. The effects of pre- and postnatal depression in fathers: a natural experiment comparing the effects of exposure to depression on offspring. *J Child Psychol Psychiatry* 2008;49:1069–78.
- [16] Ramchandani P, Stein A, O'Connor TG, Heron JON, Murray L, Evans J. Depression in men in the postnatal period and later child psychopathology: a population cohort study. *J Am Acad Child Adolesc Psychiatry* 2008;47:390–8.
- [17] Compas B, Phares V, Banez G, Howell D. Correlates of internalizing and externalizing behavior problems: perceived competence causal attributions, and parental symptoms. *J Abnorm Child Psychol* 1991;19:197–218.
- [18] Papp L. Longitudinal associations between parental and children's depressive symptoms in the context of interparental relationship functioning. *J Child Fam Stud* 2012;21:199–207.
- [19] Pearson RM, Evans J, Kounali D, Lewis G, Heron J, Ramchandani PG, et al. Maternal depression during pregnancy and the postnatal period: risks and possible mechanisms for offspring depression at age 18 years. *JAMA Psychiatry* 2013;70:1312–9.
- [20] Ablow JC, Measelle JR, Kraemer HC, Harrington R, Luby J, Smider N, et al. The MacArthur three-city outcome study: evaluating multi-informant measures of young children's symptomatology. *J Am Acad Child Adolesc Psychiatry* 1999;38:1580–90.
- [21] Arseneault L, Kim-Cohen J, Taylor A, Caspi A, Moffitt T. Psychometric evaluation of 5- and 7-year-old children's self-reports of conduct problems. *J Abnorm Child Psychol* 2005;33:537–50.
- [22] Luby JL, Belden A, Sullivan J, Spitznagel E. Preschoolers' contribution to their diagnosis of depression and anxiety: uses and limitations of young child self-report of symptoms. *Child Psychiatry Hum Dev* 2007;38:321–38.
- [23] Ringoot AP, Jansen PW, Steenweg-de Graaff J, Measelle JR, van der Ende J, Raat H, et al. Young children's self-reported emotional, behavioral, and peer problems: the Berkeley Puppet Interview. *Psychol Assess* 2013;25:1273–85.
- [24] Jaddoe VW, van Duijn CM, Franco OH, van der Heijden AJ, van IJzendoorn MH, de Jongste JC, et al. The Generation R Study: design and cohort update 2012. *Eur J Epidemiol* 2012;27:739–56.
- [25] WHO. Composite International Diagnostic Interview (CIDI). Geneva: World Health Organization; 1990.
- [26] Tharner A, Luijk MP, Van IJzendoorn MH, Bakermans-Kranenburg MJ, Jaddoe VW, Hofman A, et al. Maternal lifetime history of depression and depressive symptoms in the prenatal and early postnatal period do not predict infant–mother attachment quality in a large, population-based Dutch cohort study. *Attach Hum Dev* 2012;14:63–81.
- [27] De Beurs E. Brief symptom inventory. Leiden, Netherlands: Pits Publishers; 2004.
- [28] Ablow JC, Measelle JR. Manual for the Berkeley Puppet Interview: symptomatology, social, and academic modules (BPI 1.0). MacArthur foundation Research Network Psychopathology and Development (David J. Kupfer, Chair): The MacArthur Working Group on Outcome Assessment; University of Pittsburgh; 2003.
- [29] Achenbach TM, Rescorla LA. Manual for the ASEBA preschool forms and profiles. Burlington: University of Vermont, Research Center for Children, Youth and Families; 2000.
- [30] Statistics Netherlands. Allochtonen in Nederland [foreigners in the Netherlands]. Statistics Netherlands: Voorburg/Heerlen; 2004.
- [31] Van Bon WH, Hoekstra JG. Taaltests voor kinderen. Lisse: Swets and Zeitlinger; 1982.
- [32] Goldwasser MA, Fitzmaurice GM. Multivariate linear regression analysis of childhood psychopathology using multiple informant data. *Int J Methods Psychiatr Res* 2001;10:1–10.
- [33] Foland-Ross LC, Gotlib IH. Cognitive and neural aspects of information processing in major depressive disorder: an integrative perspective. *Front Psychol* 2012;3:489.
- [34] Measelle JR, Ablow JC, Cowan PA, Cowan CP. Assessing young children's views of their academic, social, and emotional lives: an evaluation of the self-perception scales of the Berkeley Puppet Interview. *Child Dev* 1998;69:1556–76.
- [35] Johnson-Kozlow M, Wahlgren DR, Hovell MF, Flores DM, Liles S, Hofstetter CR, et al. Adolescents validly report their exposure to secondhand smoke. *J Clin Epidemiol* 2010;63:914–9.
- [36] Robitail S, Siméoni M-C, Ravens-Sieberer U, Bruil J, Auquier P. Children proxies' quality-of-life agreement depended on the country using the European KIDSCREEN-52 questionnaire. *J Clin Epidemiol* 2007;60:469–78.
- [37] Bongers IL, Koot HM, van der Ende J, Verhulst FC. The normative development of child and adolescent problem behavior. *J Abnorm Psychol* 2003;112:179–92.
- [38] Franić S, Middeldorp CM, Dolan CV, Ligthart L, Boomsma DI. Childhood and adolescent anxiety and depression: beyond heritability. *J Am Acad Child Adolesc Psychiatry* 2010;49:820–9.
- [39] Sullivan PF, Neale MC, Kendler KS. Genetic epidemiology of major depression: review and meta-analysis. *Am J Psychiatry* 2000;157:1552–62.
- [40] Singh AL, D'Onofrio BM, Slutske WS, Turkheimer E, Emery RE, Harden KP, et al. Parental depression and offspring psychopathology: a children of twins study. *Psychol Med* 2011;41:1385–95.
- [41] Lovejoy MC, Graczyk PA, O'Hare E, Neuman G. Maternal depression and parenting behavior: a meta-analytic review. *Clin Psychol Rev* 2000;20:561–92.
- [42] Low SM, Stocker C. Family functioning and children's adjustment: associations among parents' depressed mood, marital hostility,

- parent-child hostility, and children's adjustment. *J Fam Psychol* 2005;19:394–403.
- [43] Paquette D. Theorizing the father-child relationship: mechanisms and developmental outcomes. *Hum Dev* 2004;47:193–219.
- [44] Wilson S, Durbin CE. Effects of paternal depression on fathers' parenting behaviors: a meta-analytic review. *Clin Psychol Rev* 2010;30:167–80.
- [45] Davis RN, Davis MM, Freed GL, Clark SJ. Fathers' depression related to positive and negative parenting behaviors with 1-year-old children. *Pediatr* 2011;127:612–8.
- [46] Martin LA, Neighbors HW, Griffith DM. The experience of symptoms of depression in men vs women: analysis of the national comorbidity survey replication. *JAMA Psychiatry* 2013;70:1100–6.
- [47] Giallo R, Cooklin A, Wade C, D'Esposito F, Nicholson JM. Maternal postnatal mental health and later emotional-behavioural development of children: the mediating role of parenting behaviour. *Child Care Health Dev* 2014;40:327–36.
- [48] Wolke D, Waylen A, Samara M, Steer C, Goodman R, Ford T, et al. Selective drop-out in longitudinal studies and non-biased prediction of behaviour disorders. *Br J Psychiatry* 2009;195:249–56.