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Document type

Postprint (accepted version)

This version is available at

<https://doi.org/10.17169/refubium-29580>

Citation details

Dittrich K, Fuchs A, BERPPOHL F, Meyer J, Führer D, Reichl C, et al. Effects of maternal history of depression and early life maltreatment on children's health-related quality of life. *Journal of Affective Disorders*. [Online] Elsevier BV; 2018;225: 280–288. DOI: 10.1016/j.jad.2017.08.053

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**Effects of maternal history of depression and early life maltreatment on children's
health-related quality of life**

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Abstract

Background

There is a well-established link between maternal depression and child mental health. Similar effects have been found for maternal history of early life maltreatment (ELM). However, studies investigating the relationship of children's quality of life and maternal depression are scarce and none have been conducted for the association with maternal ELM. The aim of the present study was to investigate the effects of maternal history of ELM and depression on children's health-related quality of life and to identify mediating factors accounting for these effects.

Methods

Our study involved 194 mothers with and without a history of depression and/or ELM and their children between five and 12 years. Children's quality of life was assessed as maternal proxy- and child self-ratings using the KIDSCREEN. We considered maternal sensitivity and maternal parenting stress as potential mediators.

Results

We found an effect of maternal history of depression but not of maternal history of ELM on health-related quality of life. Maternal stress and sensitivity mediated the effects of maternal depression on child global health-related quality of life, as well as on the dimensions Autonomy & Parent Relation, School Environment (maternal and child rating), and Physical Well-being (child rating).

Limitation

Due to the cross-sectional design of the study, causal interpretations must be made with caution. Some scales yielded low internal consistency.

Conclusions

Maternal impairments in areas of parenting which possibly developed during acute depression persist even after remission of acute affective symptoms. Interventions should target parenting stress and sensitivity in parents with prior depression.

Key words: quality of life; depression; maltreatment; child; sensitivity; stress

Introduction

A common reaction to early life maltreatment (ELM¹) experiences is a depressive disorder in adulthood (Heim and Nemeroff, 2001; Putnam, 2003; Springer et al., 2007). A growing body of research suggests that ELM not only has negative implications for the person concerned but may provoke intergenerational effects by acting as a risk factor for impaired mental health in the offspring. More precisely, children of mothers that experienced ELM show deficits in their social-emotional development and are at an elevated risk for emotional and behavioral problems that are considered precursors of oppositional defiant and affective disorders (Bosquet Enlow et al., 2016; Briggs et al., 2014; Schwerdtfeger et al., 2013). Intergenerational effects have also been demonstrated in depressive disorders as children of depressed mothers are more likely to exhibit a range of maladaptive behaviors, including difficulties in emotion regulation, academic and social problems at school, internalizing and externalizing behaviors, and insecure attachment (Gelfand and Teti, 1990; Goodman and Gotlib, 1999).

The above-mentioned studies have focused on the prevalence of psychiatric symptoms or disorders in offspring as outcome measures. However, measuring the occurrence of symptoms or disease poses only a partial aspect of health and wellbeing and lacks the subjective representation of function (Ravens-Sieberer et al., 2001). More precisely, the World Health Organization (WHO) defines health as “not merely the absence of disease”, but furthermore “a state of complete physical, mental and social well-being” (World Health Organisation, 1948). Also referred to as health-related quality of life (HRQoL²), this often neglected component of health is a multidimensional construct that comprises several aspects of a person’s well-being and function including physical, mental, behavioral, emotional, and

Abbreviations

¹ ELM=Early Life Maltreatment

² HRQoL=Health-related Quality of Life

social components as perceived by the person him- or herself and related individuals (Bullinger, 2011; Ravens-Sieberer et al., 2001). In conclusion, to fully understand how a person feels and copes with everyday life, researchers need to address measures of quality of life.

However, studies investigating the relationship of maternal history of ELM and depression on child HRQoL are scarce. So far, a negative association between general parental mental health problems and HRQoL of their children has been reported in previous research: Children of mentally ill parents show lower HRQoL than reference samples derived from the general population –whereas the quality of life is particularly affected in children with parents displaying a more depressive coping style (Giannakopoulos et al., 2009; Jeske et al., 2009; Wiegand-Grefe et al., 2012). Concordantly, parental depressive symptoms have been identified as significant predictor of lower child HRQoL (Wiegand-Grefe et al., 2010). Thus, the literature indicates a negative effect of parental depression on their children’s HRQoL. However, previous research has solely focused on acute depressive symptoms in parents and relied on parent-ratings of child HRQoL. Furthermore, mediating factors between parental depression and child HRQoL remain to be elucidated.

Even though previous work has given some insight into maternal psychopathology as a risk factor for child HRQoL, research to date has not explored how maternal history of ELM may affect child HRQoL. Importantly, ELM is often associated with major depression in adulthood (Springer et al., 2007). The majority of studies fails to account for the co-occurrence of both maternal risk factors, although effects of depression might be confounded by effects of ELM and vice versa. To address this issue, the present study included the investigation of both maternal depression and maternal ELM in one study allowing us to disentangle the effects of these factors. Thus, the first aim of our study was to investigate the effects of maternal history of ELM and depression in remission on child HRQoL.

Acute symptoms of depression may affect response patterns in psychometric instruments and lead to over-reporting of child behavior problems (Fergusson et al., 1993). In our study, we examined mothers with depression in remission only in order to prevent this often-neglected problem and to address the question whether maternal depression impacts on child HRQoL even after full remission. There are two reasons why children of mothers with fully remitted depression would still exhibit lower HRQoL: (1) even though maternal symptom are remitted, child HRQoL might not recover from impairments caused by maternal acute depressive symptoms in the past; (2) maternal emotional-cognitive deficits (Joormann and Gotlib, 2007; Lange et al., 2012) and negative parenting behaviors (Lovejoy et al., 2000) might persist after full remission of affective symptoms.

An important aim in the research of intergenerational transmission is the identification of underlying mechanisms (Rutter, 1998). Prior research has identified parenting behavior as a potential pathway of intergenerational transmission of maternal depression and ELM (Dixon et al., 2005; McCarty et al., 2003). Specifically, previous studies found maternal depression and a maternal history of ELM to be associated with higher levels of parenting stress (Milgrom and McCloud, 1996; Pereira et al., 2012) and lower levels of maternal sensitivity (Campbell et al., 2007; Driscoll and Easterbrooks, 2007; Kluczniok et al., 2016), which is the accurate and timed responsiveness to and perception of the child's signals. Furthermore, studies indicate an association of high parenting stress and

low maternal sensitivity with low child HRQoL (Campbell, 1995; Kidwell et al., 2015). Consequently, both maternal sensitivity and parenting stress could function as mediators for the effects of maternal history of ELM and depression on child HRQoL; however, this link has not been examined so far. Hence, we aim to fill this gap and investigate whether maternal sensitivity and parenting stress mediate effects of maternal history of ELM and depression on child HRQoL.

The present study tested two hypotheses: (1) both, severity of maternal history of ELM and depression predict child HRQoL. (2) Maternal sensitivity and perceived parenting stress mediate these associations. In addition, in contrast to previous investigations, we did not solely rely on parent-ratings of child HRQoL but also considered the child's individual perspective.

Method

Participants and Procedure

The current study was performed within the framework of the UBICA (Understanding and Breaking the Intergenerational Cycle of Abuse) multicenter project which investigates the effects of maternal history of ELM on mother–child interaction and child well-being. The present study involved 194 mothers and their children between five and 12 years of age who all attended primary school (see Table 1 for demographic variables). As an inclusion criteria mother and child had to live together.

Mother-child dyads were recruited by advertisement (e.g. gynecologists' and psychiatrists' outpatient clinics) in Berlin and Heidelberg. Additionally, we re-contacted mothers from a previous study in Heidelberg (Moehler et al., 2007). We included mothers who experienced physical and sexual abuse in their childhood before the age of 17 (moderate or severe score in CECA interview; Bifulco et al., 1994) with or without at least one episode of Major Depression (MD) later in life (M.I.N.I., Sheehan et al., 1998), mothers with at least one lifetime MD and no history of childhood maltreatment, and healthy mothers with no history of childhood maltreatment nor lifetime MD. Mothers who had experienced an episode of MD had to be currently in full remission as defined by a Hamilton Depression Scale (HAMD; Hamilton, 1960) score of below or equal seven.

Exclusion criteria were severe physical or neurological diseases, severe physical or mental disabilities of mother (Schmidt and Metzler, 1992) or child (CFT 20-R; Weiss et al., 2006; CFT 1-R; Weiss and Osterland, 1997), and the following psychiatric disorders that would have a negative impact on the participation in the study: substance addictions in the last half year, schizophrenic disorders, bipolar and manic disorders, acute depression, posttraumatic stress disorder as assessed by the Mini International Neuropsychiatric Interview (M.I.N.I.; Sheehan et al., 1998), and borderline personality disorder or antisocial personality

disorder as assessed by the International Personality Disorder Examination (IPDE; Loranger et al., 1997). None of the participating mothers included in these analyses suffered from any current psychiatric disorder as assessed by the M.I.N.I. (Sheehan et al., 1998). Psychotropic drug medication did not represent an exclusion criterion; however, dosage had to be stable for at least two weeks before study entrance.

Approval for the study was obtained by the ethics committees of the Charité – Universitätsmedizin Berlin and the Faculty of Medicine of Heidelberg. Written informed consent was obtained from all participants after the nature of the procedure was explained.

Measures

Maternal Depression.

We implemented the Mini-International Neuropsychiatric Interview (M.I.N.I.; Sheehan et al., 1998) to assess maternal history of depression (and other diagnoses of DSM-IV axis I disorders). The M.I.N.I. is a fully structured diagnostic interview for screening DSM axis I disorders. Previous research has shown good interrater reliability (Sheehan et al., 1997).

Maternal History of ELM.

We conducted the Childhood Experience of Care and Abuse (CECA) Interview (Bifulco et al., 1994; German Version: Kaess et al., 2011) to assess maternal experiences of ELM. The CECA is a retrospective semi-structured clinical interview that uses investigator-based ratings to collect retrospective accounts of adverse childhood experiences (up to an age of 17 years), such as sexual, physical, and emotional abuse, neglect, and antipathy, which are rated on a 4-point scale of severity (“severe,” “moderate,” “mild,” or “little/none”) according to predetermined criteria and manualized threshold examples. Interviewers had been intensively trained by the developer of the interview.

Child Quality of Life.

To assess children's health-related quality of life (HRQoL) we implemented the KIDSCREEN-27 questionnaire (The Kidscreen Group Europe, 2006). The KIDSCREEN is available in three versions of 52, 27 and 10 items, each providing parallel forms of parental proxy-rating and child self-rating. Underlying a multidimensional construct of quality of life that covers various aspects of well-being and functioning, the 27-item version covers five dimensions of HRQoL (KIDSCREEN-27). In brief, *Physical Well-being* explores levels of physical activity, energy, and fitness; *Psychological Well-being* comprises positive emotions and satisfaction with life; *Autonomy & Parent Relation* addresses the quality of interaction between child and parent and the child's perceived level of autonomy; *Social Support and Peers* includes the quality of interactions with and support of friends and peers; and *School Environment* comprises the child's perception on concentration and learning capacity and feelings about school and teachers (see Ravens-Sieberer et al., 2014 for more detailed descriptions). The KIDSCREEN-27 contains the 10 items of the shorter KIDSCREEN-10 version that does not provide dimensional scores, but results in a global score of HRQoL. In this study, we report results on all five KIDSCREEN-27 dimensions as well as the global KIDSCREEN-10 (Figure 1). We like to emphasize that the global HRQoL score is not merely a sum score of the KIDSCREEN-27 dimensions, but an index that comprises the most important aspects of HRQoL across all dimensions to allow a more comprehensive conclusion.

The KIDSCREEN measures provide norms for children from eight to 18 years of age. Because children in our study were aged five to twelve we report raw scores, which were standardized to a scale ranging from 0 to 100 (whereby higher scores indicate higher HRQoL) to ease interpretation. We administered the child self-rating version of the KIDSCREEN as a face-to-face interview. Response categories were visualized using decks of LEGO bricks with different heights.

Parenting Stress.

We implemented the *Eltern-Belastungs-Inventar* (EBI; Tröster, 2011), the German adaptation of the Parenting Stress Index (PSI; Abidin, 1995), which is an established instrument that provides indications for difficulties in the parent-child relationship caused by elevated parenting stress. Tröster (2011) reports high reliabilities for the global (Cronbach's $\alpha=.95$), child ($\alpha=.91$), and parental scale ($\alpha=.93$). The parental domain comprises constraints in parental functionality that result from specific behavioral dispositions and availability of resources relevant for child-rearing. To avoid confounding effects with the KIDSCREEN questionnaire, which shows some similarity to the child domain questions of the EBI, the results reported in this study refer solely to the parent domain of the EBI. However, analyses including the global parenting stress score produced similar results.

Maternal Sensitivity.

We observed maternal sensitivity as a dimension of the Emotional Availability Scales (EA Scales, 4th Edition; Biringen, 2008) in a standardized playroom setting. During the first 15 minutes, mothers and children were told to play as they would normally do. We provided a set of different toys. For further 6 minutes, dyads were instructed to solve a hardly solvable puzzle task ("shape by shape"). In order to induce stress, a time limit was set and the extreme difficulty of the task was pointed out. Mothers were instructed to support the child but not to solve the puzzle for the child. The EA Scales were rated on a one to seven scale across the two situations. We were particularly interested in maternal sensitivity, which constitutes the core dimension of parental EA, and will therefore report only on this scale. Maternal sensitivity refers to an accurate and timed responsiveness to and perception of the child's signals. It includes the emotional connection to the child as well as a positive and authentic maternal affect. EA was rated by three coders that had been approved as reliable to code by Zeynep Biringen after an extensive training period. All raters were blind to background information of the dyad. Every video was rated independently by at least two coders; coding

discrepancies were resolved through discussion. The interrater reliability (average-measure intra-class correlations) for pairs of raters before discrepancy resolution ranged from $r=.81$ to $r=.88$. Coders were blind to maternal history of depression and childhood abuse and videos were randomly assigned to them.

Statistical Analyses

Cronbach's α was computed for the global KIDSCREEN-10 and five KIDSCREEN-27 dimensions as an estimate of reliability (internal consistency). Levels of agreement between the maternal proxy-rating and child self-rating were estimated using intra-class correlation coefficients (ICC). Regression diagnostics were applied and extreme outliers with a z -score greater $| 3.29 |$ (thus located outside the limits of the normal distribution) were removed for each dependent variable, respectively, before regression and mediation analyses were run.

For each scale of the KIDSCREEN, a hierarchical regression analysis was run. The control variables age of child, sex of child and mother's years of education were entered in the first step. Maternal history of ELM and history of depression were entered in the second step.

Mediation analyses were solely run for those KIDSCREEN dimensions that showed significant effects in regression analyses. We tested the significance of the indirect effects using bootstrapping procedures. Bias-corrected bootstrap confidence intervals for the indirect effect (based on 10,000 bootstrap samples) entirely above or below zero were considered significant. All mediation analyses were controlled for maternal years of education, child sex and child age.

All analyses were run with IBM SPSS Statistics Version 23. For mediation analyses, the SPSS macro PROCESS by Hayes (2013) was used.

Results

Descriptive statistics

Descriptive statistics on all dimensions of the KIDSCREEN can be found in Table 2. Cronbach's alpha as a measure of internal consistency and intra-class correlation coefficients as a measure of interrater reliability between maternal and child ratings of the global KIDSCREEN-10 and five KIDSCREEN-27 dimensions are presented in Table 3 and 4.

Impact of maternal history of depression and ELM on child HRQoL

KIDSCREEN-10: Global HRQoL.

Child and Maternal Rating: Maternal history of depression significantly predicted child global HRQoL, maternal history of childhood maltreatment did not (Table 5).

KIDSCREEN-27: Physical Well-being.

Child rating: Maternal history of depression significantly predicted children's physical wellbeing, maternal history of childhood maltreatment did not (Table 5).

Maternal rating: Neither maternal history of depression, $\beta=.26$, $t=0.314$ (171), $p=.754$, nor maternal history of childhood maltreatment, $\beta=-.039$, $t=-0.480$ (171), $p=.632$, predicted child physical wellbeing.

KIDSCREEN-27: Psychological Well-being.

Child rating: Neither maternal history of depression, $\beta=-.115$, $t=-1.425$ (184), $p=.156$, nor maternal history of childhood maltreatment, $\beta=-.080$, $t=-1.015$ (184), $p=.312$, predicted child psychological wellbeing.

Maternal rating: Neither maternal history of depression, $\beta=-.093$, $t=-1.113$ (174), $p=.267$, nor maternal history of childhood maltreatment, $\beta=-.112$, $t=-1.362$ (174), $p=.175$, predicted child psychological wellbeing.

KIDSCREEN-27: Autonomy & Parent Relation.

Child and Maternal Rating: Maternal history of depression significantly predicted child HRQoL regarding Autonomy & Parent Relation, maternal history of childhood maltreatment did not (Table 5).

KIDSCREEN-27: Peers and Social Support.

Child rating: Neither maternal history of depression, $\beta=-.056$, $t=-0.675$ (186), $p=.501$, nor maternal history of childhood maltreatment, $\beta=.031$, $t=0.383$ (186), $p=.702$, predicted child HRQoL regarding peers and social support.

Maternal rating: Neither maternal history of depression, $\beta=-.105$, $t=-1.287$ (178), $p=.200$, nor maternal history of childhood maltreatment, $\beta=-.008$, $t=-0.096$ (178), $p=.924$, predicted child HRQoL regarding peers and social support.

KIDSCREEN-27: School environment.

Child and Maternal Rating: Maternal history of depression significantly predicted child HRQoL regarding School Environment, maternal history of childhood maltreatment did not (Table 5).

Mediation Analyses

Mediation analyses were solely conducted for the global HRQoL scale and those subscales of HRQoL (Physical Well-being in the child rating, Autonomy & Parent Relation, and School Environment) that were predicted by maternal history of depression on a statistically significant level in the regression analyses above. In order to test our mediation hypotheses, we conducted multiple mediation analyses using ordinary least squares path analyses. Maternal history of depression was entered as the independent variable, global HRQoL/dimensions of HRQoL were entered as outcome variables, and parenting stress and

maternal sensitivity were entered as mediator variables. Figure 2 depicts the path analytic model. Maternal sensitivity and parenting stress were not correlated, $r=.05$, $p=.51$.

Maternal Proxy-Rating.

As seen in Table 6, maternal history of depression significantly predicted parenting stress (path a_1) and maternal sensitivity (path a_2). Moreover, parenting stress (path b_1) and maternal sensitivity (path b_2) significantly predicted global HRQoL, and the KIDSCREEN-27 dimensions Autonomy & Parent Relation and School Environment. Bias-corrected bootstrap confidence intervals for the indirect effects (paths a_1b_1 and a_2b_2) based on 10,000 bootstrap samples were entirely below zero (see Table 6). Thus, the indirect effects were statistically significant. There was no evidence that maternal history of depression influenced child HRQoL independent of its effects on parenting stress and sensitivity (path c'), therefore full mediation was present.

Child Self-Rating.

Maternal history of depression indirectly influenced child global HRQoL, and the KIDSCREEN-27 subscales Physical Well-being, Autonomy & Parent Relation, and School Environment through its effect on parenting stress. Children of mothers with higher levels of parenting stress (path b_1) showed lower HRQoL on all scales included except of Physical Well-being. However, no associations of maternal sensitivity and child HRQoL were found for the child self-ratings. Bias-corrected bootstrap confidence intervals for the indirect effects via parenting stress (paths a_1b_1) were below zero and thus statistically significant. The direct effects of maternal history of depression on child global HRQoL and Autonomy & Parent Relation were still significant, suggesting that partial mediation was present.

Discussion

The present study was the first to investigate the effects of maternal history of early life maltreatment (ELM) and depression on child quality of life, including 194 mothers and their children between five to 12 years of age. We found a negative effect of maternal history of depression but not of maternal history of ELM on child HRQoL. Specifically, significant effects of maternal depression emerged in both maternal proxy-rating and child self-rating on global HRQoL as well as on the HRQoL dimensions Autonomy & Parent Relation and School Environment. Furthermore, we found an effect of maternal history of depression for the child-rating of the HRQoL dimension Physical Well-being. Additionally, we provide evidence for potential pathways of this intergenerational transmission. Both parenting stress and maternal sensitivity mediated the effects of maternal history of depression on HRQoL in maternal proxy-ratings. As for the child self-ratings, effects of maternal history of depression on HRQoL were mediated by parenting stress.

Impact of maternal history of ELM and depression on child quality of life

Our first hypothesis was partially confirmed as we found an effect of maternal history of depression on child HRQoL. However, there was no evidence that maternal experience of ELM alone had an impact on child HRQoL.

The present study adds to the existing literature in the following regards: First, the majority of studies investigating the effects of maternal depression on children's well-being have mostly used maternal assessments of child outcomes. The present study provides results based on assessments of the child him- or herself. Second, previous studies showed evidence for a negative effect of maternal acute depressive symptoms on child HRQoL (Wiegand-Grefe et al., 2010). We found similar results for mothers who were fully remitted from depression. There are two possible factors that could explain this finding: On the one hand, cognitive-emotional and behavioral alterations (including alterations concerning maternal

behavior) may persist even after complete remission of affective symptoms (Lange et al., 2012; Lovejoy et al., 2000). On the other hand, effects of maternal acute depressive episodes on child HRQoL may persist after remission of depression. Third, including both maternal depression and maternal ELM in one study allowed us to disentangle the effects of these two factors. In our study, we did not find an effect of ELM on child HRQoL while significant results emerged for maternal history of depression. We can exclude confounding effects of ELM on the association of maternal history of depression and child HRQoL.

Taking a further look into the five dimensions of the KIDSCREEN-27 instrument, certain aspects of children's HRQoL showed to be more affected by maternal depression than others. In line with work by Wiegand-Grefe et al. (2010) which demonstrated negative associations between acute maternal depressive symptoms and child HRQoL on the dimensions "Family" and "School" (of the KINDL-R questionnaire; Ravens-Sieberer and Bullinger, 2000), offspring of mothers with a history of depression were also most affected on the HRQoL dimensions Autonomy & Parent Relation and School Environment in our study. Our finding of perceived impairments in parent relationship is in accordance with findings of previous studies showing that maternal depression has a negative impact on parenting behavior (Lovejoy et al., 2000) and quality of mother-child interaction (Kluczniok et al., 2016). Maternal depression may also lead to children's impairments in different areas of psychosocial functioning, including the development of behavior problems or psychopathology, lower levels of social competence and self-esteem (Cummings and Davies, 1994), and social and academic adjustment to problems at school (Downey and Coyne, 1990). Impairments in the academic context might be especially relevant as this context poses particular demands on the child's functioning and may thus explain lower HRQoL observed in the School Environment in the present study.

We found a negative association between maternal history of depression and the HRQoL dimension of Physical Well-being in the child-ratings but not the maternal ratings. Similarly, Wiegand-Grefe et al. (2010) found no significant associations of child physical well-being, as assessed by maternal ratings (KINDL-R), and maternal depressive symptoms (Wiegand-Grefe, Jeske, Bullinger, Plaß, & Petermann, 2010) not taking into account the child's individual perspective. There are two possible explanations for our findings: first, children of mothers with history of depression may express stress with psychosomatic complaints; and second, as questions of this scale refer to general health, fitness, energy and amount of physical activity, children of mothers with history of depression could be less physically active. Other researchers have found a negative association between caregivers' depressive symptoms and child's health-promoting behaviors (Yoo et al., 2015) supporting this notion. Mothers with a history of depression might be less aware of these two issues of child physical well-being leading to discrepancies in maternal and child ratings.

In contrast to previous findings by Wiegand-Grefe et al. (2010) we found no associations of maternal depression on Psychological Well-being of the child. A possible explanation could be that we examined mothers with depression in remission as opposed to mothers with an acute depressive episode. As acute depressive symptoms include negative emotionality, hopelessness and lack of motivation, these maternal symptoms might directly affect mood and psychological well-being in children, but no longer persist when maternal depression has remitted. Another explanation would be that the KIDSCREEN dimension Psychological Well-being exclusively examines internalizing behaviors (like mood, loneliness, motivation, self-esteem) and thus does not represent the wider scope of psychological problems children at this age may experience.

In accordance with previous research (Wiegand-Grefe et al., 2010), we found no effects on the dimension Peers & Social Support. In fact, Wiegand-Grefe et al. (2010) found

even positive associations with duration of parental mental disorder and the quality of life subscale “Friends” (KINDL-R). They concluded that with increasing exposure to parental mental illness children rely on compensatory resources outside of their home and family such as supportive peer groups.

We found no effect of maternal history of ELM on child HRQoL even though previous research has shown that ELM poses a general risk factor for child functioning in terms of psychiatric and attachment problems (Bosquet Enlow et al., 2016; Mizuki et al., 2015). We conclude that maternal history of ELM has differential effects on distinct aspects of health as defined by the WHO (1948): Maternal ELM may not affect children’s subjective experience of well-being even though it poses a higher risk for psychopathology. In contrast, maternal depressive symptoms might cause greater impairments on family function and everyday life and therefore lead to broader effects on children’s well-being.

Mediating effect of maternal parenting stress and sensitivity

In concordance with our second hypothesis, we identified two potential pathways for the relationship between maternal history of depression and offspring HRQoL. For the maternal ratings of children’s HRQoL, maternal parenting stress and sensitivity fully mediated the associations between maternal history of depression and children’s HRQoL (global score and dimensions Autonomy & Parent Relation and School Environment). For the child ratings of HRQoL, maternal parenting stress fully mediated the effects of maternal history of depression on child HRQoL on the dimensions Physical Well-Being and School Environment and partially on child global HRQoL and the dimension Autonomy & Parent Relation. Regarding child ratings, maternal sensitivity was not a significant mediator between maternal depression and child HRQoL. Thus, our second hypothesis was only partially confirmed.

With these findings, we contribute to explaining the transmission of maternal depression onto the next generation. To the best of our knowledge, this is the first study to investigate quality of life in children of mothers with depression in remission as well as mechanisms of transmission of maternal psychopathology on child quality of life. Not only were we able to show in our first analysis that even after remission of maternal depression children show lower HRQoL, the results of our second analysis scrutinizing mediating variables help to understand why reduced HRQoL may be present also during remission. Even though depressive symptoms were fully remitted in mothers included in the study, parenting stress was elevated and maternal sensitivity was reduced. Thus, children's HRQoL may be related to altered maternal behavior not solely present during acute depressive episodes but also during remission of depressive symptoms.

Of the two possible explanations how mothers' depression could still affect child HRQoL after full remission of symptoms that we presented earlier, the second one seems even more important in consideration of our latter findings: impairments in child HRQoL caused by prior maternal depression do not appear to be simply persistent, but child HRQoL seems to be continuously affected by maternal emotional-cognitive deficits (Joormann and Gotlib, 2007; Lange et al., 2012) and negative parenting behaviors (Lovejoy et al., 2000) which might lead to lower sensitivity and elevated parenting stress even after full remission of affective symptoms.

Strength, Limitations and Future Studies

This is the first study to examine maternal history of ELM and depression on children's quality of life. The multi-informant approach in the assessment of quality of life is an important strength of the present study. We utilized well-validated interview measures instead of self-report questionnaires to evaluate maternal history of ELM and depression and assessed maternal sensitivity with an established observational measure in contrast to most

past research in the field. However, due to the cross-sectional design of the study, causal interpretations must be made with caution and prospective longitudinal studies are needed to highlight the exact mechanisms of transmission processes.

Another limitation concerns the psychometric properties of our main outcome variable. Considering that a Cronbach's $\alpha \geq .70$ is commonly considered acceptable (Nunnally, 1978), some of the HRQoL subscales yielded low internal consistency in the present study. One explanation for the low internal consistency may be that the KIDSCREEN-27 is a reduced version of the KIDSCREEN-52 instrument with relatively short scales of four to seven items. Shorter scales often show lower reliability, as alpha is a function of the number of items. Therefore, outcomes on these dimensions with low reliability should be interpreted with caution. Despite of the low internal consistency, we decided to report results on these scales in order to give a full picture of the effects on all dimensions of HRQoL. The fact that similar results emerged for child and maternal ratings on the HRQoL subscales Autonomy & Parent Relation and School Environment supports the validity of our results despite of low internal consistencies. However, the results on the child rating scale of Physical Well-being might need further replication as they deviate from results on the maternal scale and internal consistency on this scale was noticeably lower.

Mother and child agreement (intra-class correlation coefficients) ranged between .34 and .51 on the dimensions of HRQoL. ICCs were thus lower than in the healthy norm population, where ICCs between .44 and .61 have been reported (The Kidscreen Group Europe, 2006), but consistent with a longitudinal study applying the KIDSCREEN measure in a general population sample (Rajmil et al., 2013). Importantly, maternal and child rating led to similar results in our study. The discrepancy between proxy and self-ratings is an important issue in child psychology and underlines the necessity of the multi-informant approach (Eiser and Morse, 2001).

Conclusion

Our results highlight the impact of a maternal depressive disorder on the well-being of the following generation. Even though the mothers included in our study were fully remitted from depression, children showed reduced quality of life. We identified maternal sensitivity and parenting stress as mediators accounting for the relationship between maternal history of depression and offspring quality of life. Our data suggest that impairments in parenting, specifically parenting stress and sensitivity, which possibly developed during acute depression, persist during remission and continue to affect the children's quality of life. The present study contributes to understanding the intergenerational cycle of transmission in maternal depressive disorders. Future research appears desirable addressing the issue of breaking this cycle by developing interventions that target the identified mechanisms.

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Table 1. **Demographic and clinical characteristics**

Mothers	Sample (N=194) M (SD)/ %
Age in years	39.78 (5.62)
IQ	106.30 (11.29)
Years of education	17.22 (3.62)
Partnership status	
- married/in a relationship either with the father of the child or another partner	70.6%
- single, separated from partner/husband, divorced or widowed	29.4%
Nationality (German)	90.7 %
Mothers with a history of moderate/severe ELM	46.9 %
Mothers with diagnosis of rMDD	45.9 %
Age at onset (years)	27.92 (9.01)
Number of episodes	2.30 (1.46)

HAMD	1.82 (1.98)
Current Medication	47.2 %
Children	<i>M (SD) / %</i>
<hr/>	
Age in years	8.03 (1.58)
IQ	105.79 (13.11)
Sex (Girls)	108 (55.7%)
Psychiatric disorders ¹	
Anxiety disorders	5.1%
Attention-Deficit and Disruptive Behavior Disorders	6.6 %
Tic disorders	2.0 %
Elimination disorders	6.7 %
PTSD	0.5 %
Other disorders of infancy, childhood, or adolescence	0.5 %

Notes: *M*=Mean; *SD*=standard deviation; IQ=intelligence quotient; rMDD=major depressive disorder in remission; HAMD=Hamilton Rating Scale of Depression; ¹in total, 38 children (19.6 %) fulfilled diagnostic criteria for one or more psychiatric disorders

Figure 1. Structure of the KIDSCREEN Instrument including the KIDSCREEN-10 Global Score and the five KIDSCREEN-27 Dimensions

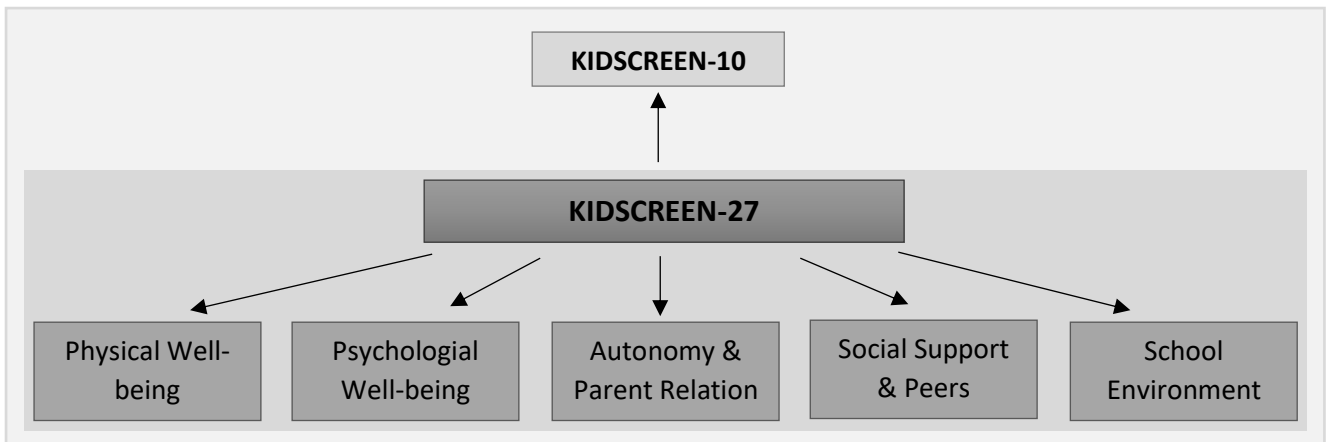


Table 2. Descriptive Statistics of KIDSCREEN-10 and KIDSCREEN-27 dimensions for child self-rating and maternal proxy-rating

	Child Self-Rating				Maternal Proxy-Rating			
	n	Mean	SD	Range	n	Mean	SD	Range
Physical Well-being	191	76.0	15.1	30.0-100	178	77.7	14.4	35.0-100
Psychological Well-being	192	81.8	13.7	35.7-100	182	79.7	11.9	39.3-100
Autonomy & Parent relation	190	75.2	15.8	28.6-100	142	77.0	10.3	46.4-100
Peers & Social Support	189	80.4	16.2	25.0-100	180	73.6	12.9	37.5-100
School Environment	192	80.6	15.9	25.0-100	178	79.6	15.1	31.3-100
Global HRQoL Index (KIDSCREEN-10)	190	79.1	12.3	40.0-100	174	76.9	10.7	45.0-100

Table 3. Reliability of KIDSCREEN-10 and KIDSCREEN-27 dimensions for maternal proxy-rating and child self-rating by age group

	Cronbach's alpha			
	5 to 7 years	8 to 12 years	Children Total	Mothers Total
Physical Well-being	.460 (n=84)	.655 (n=107)	.566 (n=191)	.791 (n=178)
Psychological Well-being	.702 (n=83)	.779 (n=109)	.747 (n=192)	.818 (n=182)
Autonomy & Parent relation	.694 (n=82)	.667 (n=108)	.711 (n=190)	.655 (n=142)
Peers & Social Support	.551 (n=81)	.582 (n=108)	.563 (n=189)	.750 (n=180)
School Environment	.703 (n=84)	.657 (n=108)	.680 (n=192)	.861 (n=178)
General HRQoL Index (KIDSCREEN-10)	.705 (n=82)	.734 (n=108)	.719 (n=190)	.801 (n=174)

Table 4. Intraclass correlation coefficients as a measure of interrater reliability between maternal proxy-rating and child self-rating by age group

	Intraclass Correlation (ICC)		
	5 to 7 years (n)	8 to 12 years (n)	Children Total (n)
Physical Well-being	.24 (80)	.43 (95)	.34 (175)
Psychological Well-being	.37 (81)	.46 (99)	.42 (180)
Autonomy & Parent relation	.53 (67)	.21 (71)	.37 (138)
Peers & Social Support	.38 (79)	.44 (96)	.41 (175)
School Environment	.37 (80)	.66 (96)	.51 (178)
Global HRQoL Index (KIDSCREEN-10)	.27 (77)	.54 (93)	.42 (170)

Table 5. Hierarchical Multiple Regression Analysis Predicting Global Health-Related Quality of Life (HRQoL) and dimensions of HRQoL: Physical Well-being (Child Rating), Child Autonomy & Parent Relation and School Environment (in Child and Parent Rating) from Maternal History of Depression and Childhood Maltreatment – non-significant results are reported in the text

	Global HRQoL				Physical Well-being		Autonomy & Parent Relation				School Environment			
	Child		Mother		Child		Child		Mother		Child		Mother	
	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β
<i>Step 1</i>	.025 ^{ns}		.034 ^{ns}		.082**		.089**		.030 ^{ns}		.002 ^{ns}		.060*	
Control ^a														
<i>Step 2</i>	.052**		.038*		.050**		.082***		.059*		0.051**		.030 ^d	
MD ^b		-.225**		-.191*		-.240**		-.292***		-.261**		-.161*		-.170*
HCM ^c		-.014 ^{ns}		-.018 ^{ns}		.035 ^{ns}		.004 ^{ns}		.036 ^{ns}		-.108 ^{ns}		-.029 ^{ns}
Total R ²	.088*		.072*		.13***		.171***		.089*		.054 ^{ns}		.093**	
<i>n</i>	188		173		188		188		141		190		177	

Note. ^a Control variables included: age of child, sex of child, and mother's years of education. ^b MD: Major Depression in Remission. ^c HCM: History of Childhood Maltreatment (the maximum score of all five CECA dimensions was entered into analyses with higher scores indicating higher severity). ^d ΔR^2 was marginal significant with $p=.050$
^{ns} not significant. * $p<.05$. ** $p<.010$. *** $p<.001$.

Figure 2. Mediation model for the relationship between maternal history of depression and child HRQoL as mediated by maternal stress and maternal sensitivity

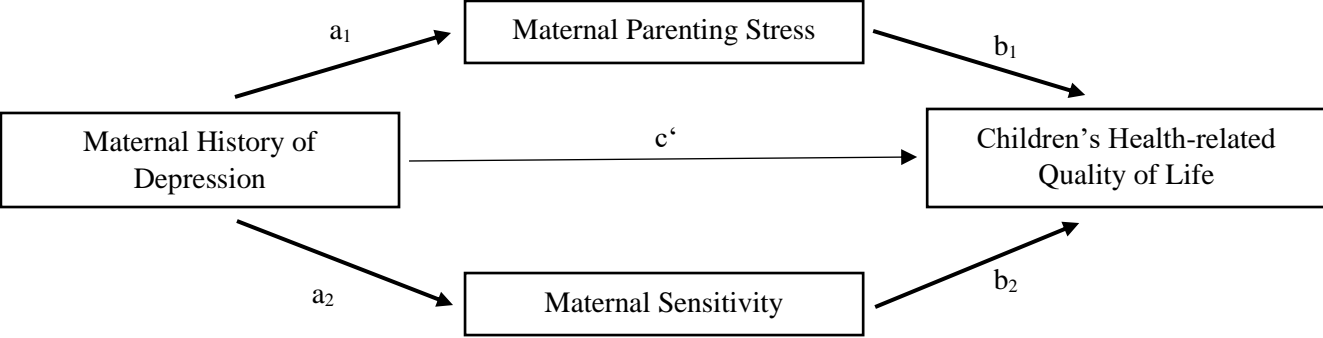


Table 6. Regression coefficients for the relationship between maternal history of depression and child HRQoL as mediated by maternal stress and maternal sensitivity

					Indirect Effects [CI]		Direct
	a ₁	a ₂	b ₁	b ₂	a ₁ b ₁	a ₂ b ₂	c'
Proxy Rating							
Global HRQoL (n=172)	11.91***	-0.53***	-0.27***	1.91*	-3.25 [-5.33, -1.59]	-1.01 [-2.27, -0.25]	-0.07 ^{ns}
Autonomy and Parent Relation (n=140)	11.34**	-0.47**	-0.19***	1.77*	-2.17 [-4.45, -0.82]	-0.84 [-2.25, -0.08]	-2.32 ^{ns}
School Environment (n=176)	11.20***	-0.51***	-0.32***	2.61*	-3.59 [-6.11, -1.78]	-1.32 [-3.10, -0.27]	-0.61 ^{ns}
Self Rating							
Global HRQoL (n=177)	10.80***	-0.51***	-0.13**	1.02 ^{ns}	-1.42 [-3.03, -0.47]	-0.51 [-1.78, 0.35]	-4.07*
Physical Well-being (n=178)	10.80***	-0.52***	-0.10 ^{ns}	0.90 ^{ns}	-1.05 [-2.67, -0.04]	-0.47 [-1.96, 0.62]	-4.23 ^{ns}
Autonomy and Parent Relation (n=177)	10.37***	-0.55***	-0.12*	1.66 ^{ns}	-1.26 [-3.14, -0.23]	-0.91 [-2.54, 0.21]	-7.36**
School Environment (n=179)	11.10***	-0.54***	-0.14*	1.70 ^{ns}	-1.51 [-3.62, -0.31]	-0.92 [-2.45, 0.13]	-4.57 ^{ns}

Note. Indicated paths a, b and ab relate to Figure 2. CI= Bootstrapped confidence intervals. ^{ns} not significant * p<.05 ** p<.01 ***p<.001. Significant indirect effects are marked bold.