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Maternal reflective functioning: influence on parenting practices and the early development of externalizing behavior

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Prenatal reflective functioning in primiparous women with a high-risk profile.

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Abstract

The concept of maternal reflective functioning (RF) has been gaining increasing interest as a possible intermediate mechanism in associations between a wide range of psychosocial risk factors and poor child outcomes. The purpose of the present study was to determine which psychosocial risk factors are linked to prenatal RF in a high-risk (HR) group of primiparous women. Differences in prenatal RF between the HR group and a low-risk (LR) control group also were examined. The sample consisted of 162 women ($M = 22.22$ years, $SD = 2.39$; 83 classified as HR). RF was coded from the Pregnancy Interview (Slade, 2007a). Risk status was assessed by means of the Mini-International Neuropsychiatric Interview-plus (M.I.N.I.-plus; Sheehan et al., 1997) and several questionnaires. HR women demonstrated significantly lower RF quality than did the LR group. Regression analyses indicated that maternal education, size of social support network, and substance use during pregnancy were the strongest predictors of prenatal RF for the HR group. The results suggest that maternal RF potentially could be an important target for those prevention and intervention programs that aim to reduce adverse psychosocial development in offspring of HR mothers.

Introduction

The transition into motherhood can be a challenging and stressful period (Heinicke, 1995). During pregnancy, women develop a new and different mindset (Stern, 1995). Pregnancy results in the activation of internalized representations of the self and the other. A woman's representations of herself as a mother and of the baby become increasingly specific during pregnancy (Slade, Cohen, Sadler, & Miller, 2009). Around the third trimester, these are fairly consolidated and become relatively stable over time (Theran, Levendosky, Bogat, & Huth-Bocks, 2005). Psychological adjustment to motherhood is partly determined by the ability to visualize oneself in the maternal role and by one's reflective functioning (RF) capacity (Slade et al., 2009). RF in the context of parenting has been defined as the mother's ability to think about herself as a parent, her child, and the relationship with her child in terms of mental states and to use this understanding to guide her responses to the child (Slade, Sadler, & Mayes, 2005). The understanding of mental states in oneself and the other is necessary to make sense of, predict, and anticipate another person's actions (Fonagy & Target, 1998). The mother's ability to adapt to the challenges and changes of pregnancy has been shown to affect children's outcomes (Darvill, Skirton, & Farrand, 2010; Paulson, Dauber, & Leiferman, 2006; Rini, Dunkel-Schetter, Wadhwa, & Sandman, 1999).

Maternal RF has been related to parenting behaviors (Grienenberger, Kelly, & Slade, 2005; Koren Karie, Oppenheim, Dolev, Sher, & Etzion-Carasso, 2002; Pajulo et al., 2008; Sokolowski, Hans, Bernstein, & Cox, 2007), attachment security (Slade, Belsky, Aber, & Phelps, 1999; Slade, Grienenberger, Bernbach, Levy, & Locker, 2005), and child development (Benbassat & Priel, 2012; Slade, 2007b; Suchman, DeCoste, & Mayes, 2009). For example, maternal RF plays a key role in helping children to develop flexible and adaptive mechanisms of self-regulation, and to establish productive and sustaining relationships (Sharp & Fonagy, 2008; Slade, Grienenberger et al., 2005). Previous research predominantly has investigated maternal RF in the postnatal period. A woman's emotional experience of pregnancy and the nature of her developing relationship with her baby are expected to influence her postnatal representations and interactive behavior with her child. Therefore, to optimize children's socio-behavioral development that may be affected by poor parenting practices and parent-child interactions, it is important to understand which factors determine the quality of prenatal RF.

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The conditions under which a pregnancy takes place vary greatly due to the amount and type of internal and external resources available. These factors could affect prenatal maternal RF. Maternal characteristics that have been negatively related to RF include psychiatric illness (Fonagy & Luyten, 2009; Levinson & Fonagy, 2004; Perry, Newman, Hunter, & Dunlop, 2015; Toth, Rogosch, & Cicchetti, 2008), substance use during pregnancy (Pajulo et al., 2012), single parenthood (Huth-Bocks, Levendosky, Bogat, & Von Eye, 2004), unavailability of support from family and friends (Larney, Cousens, & Nunn, 1997; Sadler et al., 2007; Smith, 1999), scarcity of material resources (e.g., regarding housing or financially), and low educational attainment (Pajulo, Helenius, & Mayes, 2006; Rosenblum, McDonough, Sameroff, & Muzik, 2008; Sadler et al., 2007; Theran et al., 2005; Vrieze, 2011). These factors also have been used to define risk status with respect to child socio-behavioral outcomes (World Health Organization, 2005). However, these risk factors have been investigated separately, but not simultaneously, in relation to RF, especially not in relation to prenatal RF.

The purpose of the present study was to determine which risk factors are most strongly related to prenatal RF in a sample of primiparous women with a high-risk profile (HR group). Given that many studies on maternal RF in the peripartum period have been conducted in either low-risk samples or clinical and/or high-risk samples without a control group (Grienenberger et al., 2005; Miller, 2008; Schechter et al., 2005; Suchman, DeCoste, Leigh, & Borelli, 2010), it was first examined whether prenatal RF in first-time mothers-to-be differed between the HR group and a low-risk control group (LR group). Women in the HR group were expected to have lower RF, as prior studies have shown that HR women generally tend to have more negative prenatal representations about their child, themselves, and their partner (Pajulo, Savonlahti, Sourander, Piha, & Helenius, 2001). Next, the relation between number of risk factors and prenatal RF was examined in the HR sample. The presence of more risk factors was expected to negatively impact prenatal RF because these stressors could preoccupy the mothers-to-be and interfere with their mental space to think reflectively. To provide insight in the relative contribution of each risk factor in the prediction of prenatal RF in the HR group, a number of factors that have been related to RF quality separately in earlier studies were examined concurrently. It was expected that all factors associated with risk status in this study would have independent contributions to the quality of prenatal RF. Since this is the first time that these risk factors were investigated together, no specific hypotheses were made about the relative weight of each risk factor.

Methods

Participants

The present study is part of the Mother–Infant Neurodevelopment Study in Leiden, The Netherlands (*MINDS - Leiden*). *MINDS - Leiden* is a large, longitudinal study on neurobiological and neurocognitive predictors of early behavior problems. The study was approved by the ethics committee of the Department of Education and Child Studies at the Faculty of Social and Behavioral Sciences, Leiden University, and by the Medical Research Ethics Committee at Leiden University Medical Centre. All participating women provided written informed consent. Women were recruited during pregnancy via midwifery clinics, hospitals, prenatal classes, and pregnancy fairs. Dutch-speaking, primiparous women between 17 and 25 years old with uncomplicated pregnancies were eligible to participate. We chose to oversample women from a HR background to attain sufficient variance in children’s early socio-emotional and cognitive development. After completing the prenatal visit in the third trimester of pregnancy, women were allocated to the LR or the HR group. Classification in the HR group was based on the following criteria (Mejdoubi et al., 2011; World Health Organization, 2005): (a) positive screening on current psychiatric disorder(s) or substance use (alcohol, tobacco, and/or drugs) during pregnancy or (b) presence of two or more of the following risk factors: no secondary education, unemployment, poverty or financial problems, limited social support network, single status, and young maternal age (<20 years). In case only one risk factor was present - other than an indication for current psychiatric disorder(s) or substance use - women were discussed in a clinical expert meeting to determine whether placement in the HR group was appropriate.

The total sample consisted of 79 LR women (M age = 23.47, SD = 1.79) and 83 HR women (M age = 21.05, SD = 2.28). Maternal demographic variables are summarized in Table 1.

Procedure and Measures

All participants completed a 2- to 2½-hr home visit conducted by two trained female researchers, ideally around 27 gestational weeks. The home visit included an interview regarding the emotional experience of the pregnancy, a semi-structured psychiatric interview, and a variety of questionnaires concerning demographic information, lifestyle, social support, and health of the mother-to-be.

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Prenatal reflective functioning. A Dutch translation (Smaling & Suurland, 2011) of the Pregnancy Interview-Revised (PI-R; Slade, 2007a) was administered to assess the level of prenatal RF. The PI-R is a 22-item, semi-structured interview. The questions tap into the emotional experience of the pregnancy, mother's prenatal representations of her relationship with her unborn child, and of herself as a parent. The PI-R was digitally recorded and transcribed verbatim. Coding for RF was performed using the Reflective Functioning Scoring Manual designed for use on the PI (Slade & Patterson, 2005; Slade, Patterson, & Miller, 2007). The mother's responses to the individual questions were scored, and from these, an overall score on an 11-point scale from -1 (negative RF) to +9 (full or exceptional RF) was assigned. Scores under 5 indicate either negative, absent, or low RF whereas scores of 5 and above indicate clear evidence of mentalizing (Slade et al., 2007). Transcripts were coded by trained research assistants under supervision of the first author. Fifteen percent of the interviews were coded by a second rater. Interrater agreement with intraclass correlations for individual passage scores were .87 and .90 for the overall RF score.

Psychiatric disorders. The Mini-International Neuropsychiatric Interview (M.I.N.I.; Sheehan et al., 1997) is a short, structured diagnostic interview to screen for psychiatric disorders according to the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV; American Psychiatric Association, 1994) and the International Statistical Classification of Diseases and Related Health Problems (ICD-10; World Health Organization, 1992). The current study used the Dutch version of the M.I.N.I.-plus (Van Vliet, Leroy, & Van Megen, 2000) to screen for the presence of the following disorders: depressive disorder (current), dysthymic disorder (past 2 years), suicidality, mania (current), panic disorder (current and lifetime), agoraphobia (current), social phobia (current), other type of phobia (current), obsessive-compulsive disorder (current), generalized anxiety disorder (GAD; current), posttraumatic stress disorder (PTSD; current), alcohol dependence and abuse (current and lifetime), drug dependence and abuse (non-alcohol, current and lifetime), attention deficit hyperactivity disorder (ADHD; lifetime), and antisocial personality disorder (ASPD; lifetime). Current is defined as "in the past month" for all diagnoses except GAD, which has a 6-month time frame, and alcohol abuse/dependence and drug abuse/dependence, for which a 12-month time frame is used. The interviewer rates each disorder with a score of 0 (absent) or 1 (present). The M.I.N.I.-plus has been shown to have good psychometric qualities (Van Vliet & De Beurs, 2007).

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Social network. To gain more insight in the size of mother's social support system, the Norbeck Social Support Questionnaire (NSSQ; Norbeck et al., 1981, 1983) was administered. Participants are asked to list each significant person in their lives who provides personal support to them and indicate the kind of relationship that they have with them (e.g., spouse or partner, family members, friends, work or school associates, neighbors, healthcare providers, counselor or therapist, minister/priest/rabbi, other). The total number of persons listed was used in current analyses. A categorical variable also was created and coded as 1 (<4 individuals listed) or 0 (≥ 4 individuals listed). The NSSQ has been judged to be a valid and reliable instrument to assess total network support and has been used often with pregnant women (Meadows-Oliver, Sadler, Swartz, & Ryan-Krause, 2007; Norbeck & Anderson, 1989).

Demographics, health, and lifestyle. Demographics and information about maternal health and lifestyle (including substance use) was gathered using a Dutch translation of the "Becoming a mother" questionnaire from the Cardiff Child Development Study (Hay et al., 2011). Educational level of the participants was registered using five response categories: (a) no education, (b) primary, (c) lower secondary, (d) higher secondary, and (e) tertiary education. Current substance use (tobacco, alcohol, other drugs) was assessed using three response categories: (a) never used any substance during pregnancy, (b) substance use only until pregnancy was acknowledged (first trimester only), or (c) continued substance use during pregnancy. Dichotomous variables were created for current substance use, unemployment, single parenthood, and financial problems and were coded as 1 (present) or 0 (absent). Maternal age was coded dichotomous as 0 (≥ 20 years) or 1 (<20 years). Maternal educational level also was coded as 1 (no secondary education) or 0 (secondary education or higher).

Risk status. The MINI plus, the NSSQ, and the "Becoming a mother" questionnaire were used to assess the presence of the eight predefined risk factors. The dichotomous variables that were created for the eight HR- or LR-classification factors were added together to create a total score of risk factors (possible range = 0 – 8).

Table 1. Descriptives of the total sample, and the high-risk and low-risk group.

	LR (n = 79)	HR (n = 83)	Total (N = 162)	F(df)
				χ^2 (df)
Age (years)	23.47 (1.79)	21.05 (2.28)	22.22 (2.39)	57.10 (1, 160)**
Ethnicity (% Caucasian)	91.1%	78.3%	84.6%	
Monthly family income after tax earnings (Euros)	2,893.53 (1,038.93)	1,316.94 (943.46)	2,085.77 (1,265.37)	102.41 (1, 160)**
Prenatal reflective functioning	4.28 (0.87)	3.36 (0.84)	3.81 (1.01)	41.56 (1, 160)**
Size social support network	9.42 (4.20)	6.77 (3.18)	8.06 (3.93)	20.62 (1, 160)**
Unemployed (%)	1.3%	22.9%	12.3%	17.49 (1)**
Completed at least a secondary education (%)	98.7%	89.2%	93.8%	6.41 (1)*
Financial problems (%)	0%	21.7%	11.1%	19.27 (1)**
Indication for current psychiatric disorder(s) (%)	0%	56.6%	29.0%	63.02 (1)**
Single parenthood (%)	2.5%	24.1%	13.6%	16.04 (1)**
First-time pregnant (%)	84.8%	72.3%	78.4%	3.75 (1)
Unplanned pregnancy (%)	25.3%	72.3%	49.4%	35.73 (1)**
Substance use during pregnancy (%)	0%	47.0%	24.1%	48.89 (1)**
Tobacco	0%	44.6%	22.8%	45.64 (1)**
Alcohol	0%	7.2%	3.7%	5.93 (1)*
(Other) drugs	0%	4.8%	2.5%	3.90 (1)*

Note. ** $p < .01$; * $p < .05$. Standard deviations are in parentheses. Boldface indicates chi-square statistic. LR = low-risk group, HR = high-risk group, df = degrees of freedom. In the sample the main (other) drug used during pregnancy was cannabis, no other illegal substances were used during pregnancy.

Data Analyses

Before testing the main study hypotheses, all variables were examined for outliers and violations of assumptions applying to the statistical tests used. First, we examined whether the HR and the LR groups differed on prenatal RF using analysis of variance. Since a maximum of only one risk factor (other than substance use and indication for psychiatric disorder) could be present in the LR group, subsequent analyses were performed for the HR group only. First, the relation between the number of risk factors and prenatal RF was examined for the HR sample. Subsequently, associations were examined between all risk factors and prenatal RF. Finally, to examine the relative strength of each risk factor associated with prenatal RF in the HR group, a regression analysis was conducted with the risk factors that were shown to be associated with prenatal RF in the correlational analyses. All analyses were conducted using SPSS for Windows, Version 21.0.

Results

Descriptive Statistics

Descriptive statistics and differences between the HR and the LR groups for all variables are shown in Table 1. RF scores for the whole sample ranged from 2 (inexplicit references to mental states) to 7 (marked RF). For the HR group, the RF scores ranged from 2 (12.1%) to 5 (normal RF, 10.8%), with 50.6% scoring 3 (low RF). In the LR sample, scores ranged from 3 (22.8%) to 7 (1.3%), with 39.2% scoring 4 (rudimentary RF).

More than half of the HR women had an indication for current psychiatric disorder(s) (56.6%, $n = 43$), with 15.7% ($n = 13$) having even two or more diagnoses on the M.I.N.I. - plus. Ten women scored positive on current depressive disorder, 4 on dysthymic disorder, 2 on suicidality, 5 on panic disorder, 6 on agoraphobia, 2 on social phobia, 1 on other type of phobia, 2 on PTSD, 6 on alcohol dependence and abuse, 4 on drug dependence and abuse (non-alcohol), 6 on ADHD, and 9 on ASPD.

In the HR group, 37.3% ($n = 31$) women continued smoking tobacco, 3.6% ($n = 3$) continued drinking alcohol, 1.2% ($n = 1$) continued using cannabis, 3.6% ($n = 3$) were smoking tobacco and drinking alcohol, and 3.6% ($n = 3$) continued smoking both tobacco and cannabis during pregnancy. Due to small numbers per subgroup, classification was

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based on continued substance use regardless of the substance of choice. Table 2 displays the number of risk factors present in the HR group.

Table 2. Number of risk factors present in the high-risk group.

Number of risk factors	<i>N</i>	Cumulative percentage
1	24	28.9
2	32	67.5
3	15	85.5
4	7	94.0
5	3	97.6
6	1	98.8
7	1	100.0

Risk Status and reflective functioning

Analysis of variance showed a significant difference in prenatal RF between the HR group ($M = 3.36$, $SD = 0.84$) and the LR group ($M = 4.28$, $SD = 0.97$), $F(1, 160) = 41.56$, $p < .001$, $\eta_p^2 = .21$, with the HR women scoring significantly lower. Correlation analysis showed that for the HR group, the total number of risk factors was negatively associated with prenatal RF, $r = -.34$, $p < .001$, indicating that the presence of multiple risk factors was related to lower RF. The sum score of risk factors explained 12% of the variance in prenatal RF.

Reflective functioning in the HR sample

For the HR group, associations were calculated between the variables determining HR or LR classification and prenatal RF. Pearson correlation was used to measure the association between continuous variables, while point-biserial correlations and the phi coefficient were used for the dichotomous variables. As Table 3 shows, a moderate, negative correlation was found between RF and substance use during pregnancy, indicating that substance use during pregnancy was related to lower RF. Positive correlations were found between prenatal RF and age, educational level, and size of social support network, indicating that a

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larger support network, higher maternal age, and higher education level were related to higher RF.

Next, all risk factors significantly correlating with prenatal RF were entered in a linear regression predicting RF for the HR-group (Table 4). The regression model was significant, $F(4, 78) = 7.88, p < .001, \eta_p^2 = .25$, and maternal education ($\beta = .23$), size of social support network ($\beta = .32$), and substance use during pregnancy ($\beta = -.25$) were all unique predictors of prenatal RF. Maternal age was not a significant predictor of prenatal RF over and above the effects of educational attainment, social support, and substance use.

Table 3. Associations between risk factors and prenatal reflective functioning in the high-risk sample.

	1	2	3	4	5	6	7	8
1. Reflective functioning	1							
2. Age	.25 ^{*a}	1						
3. Educational level	.38 ^{**a}	.42 ^{**a}	1					
4. Current psychiatric disorder(s)	.05 ^b	.01 ^b	-.33 ^{**b}	1				
5. Substance use during pregnancy	-.27 ^{**b}	-.06 ^b	-.19 ^{*b}	.27 ^{**c}	1			
6. Single parenthood	-.14 ^b	-.13 ^b	-.16 ^b	.09 ^c	.02 ^c	1		
7. Financial problems	-.02 ^b	-.21 ^{*b}	-.17 ^b	.03 ^c	.20 ^c	.05 ^c	1	
8. Unemployment	-.17 ^b	-.22 ^{*b}	-.36 ^{**b}	.23 ^{*c}	.06 ^c	.57 ^{**c}	.13 ^c	1
9. Size social support network	.37 ^{**a}	.27 ^{**a}	.26 ^{**a}	.11 ^b	.10 ^b	-.27 ^{**b}	-.10 ^b	-.31 ^{**b}

Note. N = 83, ** $p < .01$; * $p < .05$; ^a = Pearson correlation, ^b = point-biserial correlation, ^c = Cramer's ϕ .

Table 4. Regression analysis testing predictors of prenatal reflective functioning in the high-risk sample.

Variable	B	SE B	β	t	p	Adjusted R ²
Age	0.02	0.04	.05	0.46	.648	.25
Education level	0.24	0.11	.23	2.13	.036 [*]	
Substance use	-0.41	0.16	-.25	-2.52	.014 [*]	
Size social support network	0.09	0.03	.32	3.18	.002 ^{**}	

Note. N = 83, ** $p < .01$; * $p < .05$; β is the standardized regression coefficient.

Discussion

The present study examined whether prenatal RF differed between primiparous “at-risk” women (HR group) and a low-risk (LR) control group, and determined which specific risk factors were associated with prenatal RF in HR women. As hypothesized, HR women demonstrated significantly lower levels of prenatal RF, as compared to the LR group. The total number of risk factors had a moderate, negative relation with RF quality. This indicates that the presence of more risk factors places a higher demand on the mother-to-be, resulting in less mental resources to think about the future child and the upcoming motherhood. These findings are in line with the majority of existing studies indicating that the presence of risk factors negatively affects mothers’ RF ability, with HR women have lower RF and more negative mental representations (Huth-Bocks et al., 2004; Leigh, 2011; Seng & Prinz, 2008; Theran et al., 2005). An exception to the rule is a study by Perry et al. (2015), who found similar prenatal RF levels for both HR and LR women. However, their sample size was limited and consisted mainly of multiparous women. In addition, employment status and income were not assessed, which may have impacted between group comparisons.

For the HR group, a number of risk factors that separately have been related to RF quality were examined simultaneously to provide insight into their relative contributions to the quality of prenatal RF. Maternal age, educational attainment, social support, and substance use during pregnancy had moderate associations with prenatal RF in the HR group. Contrary to our expectations, indication for current psychiatric disorder(s), financial problems, single parenthood, and unemployment had no significant associations with prenatal RF in this group.

The non-significant association between positive screening for current psychiatric disorder(s) and prenatal RF in the HR group may be the most surprising (see Katznelson, 2014). The present study used a dichotomous measure as an indication for current psychiatric disorder(s), which may have resulted in loss of information regarding subclinical symptoms and, hence, the non-significance of effects. It is possible that the HR women without a current diagnosis according to the M.I.N.I.-plus still had psychiatric problems. Support for this suggestion comes from the fact that a large proportion of HR women had experienced psychiatric problems in the past (and received treatment for their disorder), but were currently stable or doing “well enough” to not qualify for a current

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diagnosis. Furthermore, when the regression analysis was performed on all participants (both LR and HR women), an indication for psychiatric disorder(s) was a close to significant predictor of RF, suggesting that an increase in variance (with “the absence of psychiatric problems” in LR women) increases the role of psychiatric disorder(s) as a predictor. Despite the fact that this is not the only study that failed to find associations between psychiatric problems and RF in a HR population (Rudden, Milrod, Target, Ackerman, & Graf, 2006; Schechter et al., 2005; Vrieze, 2011), it would not be wise to discard psychiatric problems as a possible predictor of RF quality based on the present results. We suspect that more in-depth clinical assessments using a more continuous scale to assess psychiatric disturbances and not self-reports are most likely to yield meaningful data. More research is necessary to further unravel the possible role of current and past psychiatric problems in relation to maternal RF.

Taking this into account, the question remained within the HR group whether there were specific risk factors adding to the prediction of RF quality. Results showed that size of social support network was the strongest predictor of prenatal RF. The availability of social support appears to benefit the adjustment to upcoming motherhood (Sadler et al., 2007; Smith, 1999), resulting in stable perceptions of the future infant in the last trimester of pregnancy (Larney et al., 1997). Feeling supported facilitates women to gain confidence in the new perceptions of themselves and eases the transition into motherhood (Darvill et al., 2010). One may speculate that social support also reduces the impact of emotional stressors and simulates psychological well-being, thereby resulting in more mental space to think reflectively.

Substance use during pregnancy was the second-strongest predictor of prenatal RF. Studies examining RF in substance-abusing mothers have consistently found that substance abuse has detrimental effects on RF (Pajulo et al., 2012; Pajulo et al., 2008; Suchman et al., 2010). The most commonly used substances in those studies were opiates and amphetamines, and to a lesser extent, cannabis and alcohol. Although all abusing women in the study by Pajulo et al. (2012) also were excessive smokers, most studies did not report data specifically regarding nicotine use. The preferred substance in our sample was tobacco, with few women using a second or other substance (alcohol or cannabis). This is the first study showing that smoking during pregnancy can be linked to lower prenatal RF. Since there are no other studies to our knowledge that have related (prenatal) RF to maternal smoking, we can only speculate about the underlying mechanisms. During pregnancy and perinatal phases, neurobiological changes take place in the mother’s brain (especially in the

reward system) that lead to a state of “maternal preoccupation” (Swain, Lorberbaum, Kose, & Strathearn, 2007). One could speculate that - at least in substance-abusing mothers - the substance use might weaken the mother’s capacity to invest in a close relationship with her future baby by interfering with natural sources of reward and satisfaction (Allen, Fonagy, & Bateman, 2008). The substance use likely leads to a preoccupied or absent mind, making it more difficult to make adequate inferences about intentions and emotions of oneself and one’s future child (Suchman, DeCoste, McMahon, Rounsaville, & Mayes, 2011). Another possibility is that women with lower RF are more inclined to smoke or continue smoking during pregnancy. Perhaps a limited capacity to think reflectively impairs a woman’s ability and willingness to fully understand the detrimental effects of substance use for her unborn child and herself. Thus, low RF might make it easier to smoke despite the pregnancy. Furthermore, both RF and smoking have been linked to other risk factors. For example, younger, single, poorer, and less educated women are more likely to smoke during pregnancy (Cnattingius, Lindmark, & Meirik, 1992; Kaneko et al., 2008; Lu, Tong, & Oldenburg, 2001; Ockene et al., 2002). In addition, both RF and maternal smoking have been associated with poor outcomes in mothers (Jacobsen et al., 2005; Yanbaeva, Dentener, Creutzberg, Wesseling, & Wouters, 2007) and their children (Benbassat & Priel, 2012; Durmus, et al., 2011; Huijbregts, Van Berkel, Swaab-Barneveld, & Van Goozen, 2011; Huijbregts, Warren, De Sonnevile, & Swaab-Barneveld, 2008). Therefore, RF–smoking associations might still represent the influence of different, yet-to-be-revealed factors, although the majority of those seem to have been taken into account in the present study. Still, more research is necessary to unravel the exact nature of the association between (prenatal) RF and maternal smoking.

The third and final predictor of prenatal RF was maternal education. Maternal education has been associated with mothers’ engagement in (appropriate) mind-minded commenting, a construct closely related to maternal RF (Meins et al., 2003; Rosenblum et al., 2008). Scoring RF is dependent on language (Slade & Patterson, 2005; Slade et al., 2007). Mothers-to-be who have had limited education and who struggle with environmental adversity may use language more instrumentally and less as a means of describing more complex emotional and cognitive experiences, resulting in lower RF. Previous research relating educational attainment and RF has shown some mixed results (Button, Pianta, & Marvin, 2001; Pajulo et al., 2012; Suchman et al., 2010). A possible explanation for these mixed results is that most studies have relied on samples that were fairly restricted regarding socio-demographics and risk status and used years of education to assess

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education level. The current study used a categorical measure of educational level, which has been related to maternal RF (Rosenblum et al., 2008).

Finally, when looking at a model to predict prenatal RF from the sum-score of risk factors, the predictive power was inferior to the proportion-explained variance by a model consisting of a specific combination of risk factors. Although the significant prediction of the sum score provides some degree of support for the cumulative risk hypothesis (Sameroff, Seifer, Barocas, Zax, & Greenspan, 1987), these results also suggest that the influence of risk factors is not equal and more complex. Future studies should investigate combinations of risk factors (e.g., moderating effects) in addition to single and additive effects. Based on the data of the present study, we argue that there should be a further expansion of attention to the complex of environmental contexts of pregnancy.

Certain limitations regarding this study should be noted. First, assessment of current psychiatric disorder(s) was done using a psychiatric interview based on common dichotomous psychiatric- classification systems. Due to small numbers per subgroup and comorbidity, no distinctions between the various psychiatric disorders or severity of the disorder(s) were made in our analyses. Second, the restricted age range of the sample limits the generalizability of results. Our sample consisted of fairly young women. Note that the psychosocial and biological context of pregnancy changes with increasing maternal age. Older maternal age has been associated with psychological benefits (more resilience, fewer symptoms of depression and anxiety) and socio-demographic factors likely to contribute to optimal adjustment (home ownership, professional occupation) (McMahon et al., 2011). In line with such findings, it may be the case that the relations of different factors associated with prenatal RF change with age as well. Third, a cross-sectional design was used, which limits the possibility to make causal inferences. Finally, the present study used a global RF score based on the interviewee's responses across all interview questions. This could have obscured differences that exist in relation to the more specific aspects of prenatal RF. RF is thought to have a self-reflective and an interpersonal component that together provide an individual with a capacity to distinguish inner from outer reality and intrapersonal mental processes from interpersonal ones (Fonagy, Gergely, Jurist, & Target, 2002). Future research should examine if prenatal RF can be regarded as a two-dimensional construct with a child-related RF component and self-related RF component.

Despite the limitations, the results of the present study provide evidence for the presence of specific risk factors associated with the quality of prenatal maternal RF in a high-risk population. HR women appear to have more inaccurate and biased preexisting

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beliefs that impact the way that they perceive and respond to information related to their upcoming motherhood and future baby. Prenatal representations and RF have predictive value for the attachment pattern of the child (Sharp & Fonagy, 2008; Slade, Cohen, Sadler, & Miller, 2006; Slade, Grienenberger, et al., 2005) and potentially for the mother's postnatal behavior (Arnott & Meins, 2007). Therefore, RF could be one of the possible mechanisms that might mediate associations between risk factors and children's developmental outcomes. Future research should explore the construct of RF in more depth and in a continuous fashion. Valuable knowledge may arise from studies investigating (longitudinal) associations between prenatal RF, postnatal RF, maternal interactive behavior with her infant, and child development.

Clinical Implications

Children from an "at-risk" population generally have higher chances of less favorable developmental outcomes. These risk factors impact child development either directly or indirectly through parenting capacities and parent-child interactions (Cyr, Euser, Bakermans-Kranenburg, & Van IJzendoorn, 2010; Seng & Prinz, 2008). Parental RF could potentially be an important target for prevention and intervention programs, as it has been associated with certain established risk factors, parenting behaviors, and child outcomes (Benbassat & Priel, 2012; Rosenblum et al., 2008; Sharp & Fonagy, 2008). Since the first foundations of the mother-infant relationship are formed prenatally, it is important to enhance the positive experience of growth in the transition to motherhood. Promoting prenatal RF could be an effective way to improve the mother's representations of her unborn child and their developing relationship. Interventions specifically focusing on improving RF of "at-risk parents" do indeed appear to increase the level of RF (Katznelson, 2014). However, intervention studies with a longitudinal design are required to further establish prenatal RF as an important intervention target while also providing evidence for causality. Interventions should start prenatally, since motivation and openness for change is often stronger during the perinatal period (Slade, 2002). Besides focusing on directly enhancing RF, programs also should focus on trying to indirectly improve RF by reducing psychosocial risk factors to further improve their efficacy.

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