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Validating an Observational Measure of Prenatal Emotional Availability among Mothers with Depressive Symptoms

Saara J. Salo, Marjo Flykt, Sanna Isosävi, Raija-Leena Punamäki, Mirjam Kalland, Zeynep Biringen, and Marjukka Pajulo

Abstract: This study describes a new observational measure for assessing mother's prenatal emotional availability in relationship towards her unborn baby (Pre-EA). Concurrent associations between a mother's Pre-EA, her adult attachment style (AAI), and prenatal maternal reflective functioning (RF) (Pregnancy Interview) were assessed among 45 pregnant women (gw 22-31) screened positive for depressive symptoms in a community-based sample. Pre-EA was measured from videotaped, semi-structured maternal-fetal interaction assessment procedure (MIM). The two Pre-EA dimensions, sensitivity and non-hostility, were related to adult secure-autonomous attachment style and higher prenatal maternal RF. The results show that the observed emotional availability may be assessed already during pregnancy.

Keywords: emotional availability, pregnancy, adult attachment, reflective functioning

Prenatal attachment refers to emotions, perceptions, and behaviors that a mother develops towards her baby during the pregnancy. This emotional bond is critical for her postpartum relationship with the child as well as for the child's later social, emotional, and cognitive development (Alhusen, 2008; Rossen et al., 2016). Maternal mental health problems during pregnancy may disrupt the development of the prenatal attachment (Alhusen, Gross, Hayat, Rose, & Sharps, 2012; Goecke et al., 2012).

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Prenatal depressive symptoms have been shown to predict postpartum depression and to be associated with fetal growth difficulties, low birth weight, and socio-emotional, behavioral, and cognitive problems later in childhood and adolescence, often through disruptions in the early emotional parent-child relationship (Field, 2010; 2011). However, we still know relatively little about the direct prenatal emotional mechanisms underlying the formation of this postnatal relationship. Clinically, there is a need for preventive assessment and intervention tools to support the emotional side of parenting already during pregnancy. These tools are especially vital in helping expectant mothers who struggle with well-known parenting risks, such as prenatal depressive symptoms. This study aims at describing a new prenatal assessment and clinical tool, Prenatal Emotional Availability observational measure (Pre-EA), and validating it with two pre-existing gold-standard prenatal parenting measures relevant for postpartum parenting and child developmental outcomes: parental attachment and reflective functioning.

Emotional Availability perspective (EA) suggests that at the core of a healthy mother-child relationship is not only behavioral, but also *emotional* responsiveness to the child's interactive cues (Biringen, Derscheid, Vliegen, Closson, & Easterbrooks, 2014; Biringen & Easterbrooks, 2012). Whereas traditional attachment theory focuses mostly on the mother's ability to provide "safe haven" during infant distress, EA framework provides a broader emphasis on parental genuine, positive affect as well as capability of withholding and regulating negative emotions and interactive behaviors towards the child (Saunders, Kraus, Barone & Biringen, 2015). Maternal EA is a multidimensional construct, comprising dimensions of maternal *sensitivity*, i.e., appropriate affective and behavioral responsiveness towards the child; *structuring*, i.e. her ability to guide, teach, and set limits while remaining in contact; *non-hostilit*y, i.e., good regulation of negative affect and *non-intrusiveness*, i.e., ability to follow child's lead and to refrain from interfering behavior towards him. From the child's side, too, dimensions of EA can be observed: *responsiveness,* i.e., appropriate affective responding towards the adult, and *involvement* i.e., actively seeking emotional contact with the adult. Maternal EA is positively linked with infant attachment security, and with various indicators of later socio-emotional well-being of the child (Biringen & Easterbrooks, 2012; Biringen et al., 2014). Furthermore, mothers with postpartum depression are known to show low EA in interactions with their children (Easterbrooks, Biesecker, & Lyons-Ruth, 2000; van Doesum, Hossman, Riksen-Walraven, & Hoofsnagels, 2007), highlighting the need to focus on the emotional qualities of parent-child relationship in interventions targeting depressed mothers. However, so far, such work has concentrated only on the postnatal period and little is known about the mother's emotional availability towards the baby during pregnancy.

Mother's postnatal EA towards the child can be measured with a video-based observational method, Emotional Availability Scales (Biringen, 2008), which is one of the most widely used observational assessments of parent-child relationship world-wide (Biringen et al., 2014). Thus, all aforementioned six EA dimensions are scored ranging from low to high measuring the EA dimensions on the basis of mother-child interaction observed either in free-play or in semi-structured situation usually lasting over 15 minutes (Biringen, 2008). Video-based observational assessments are generally considered gold-standard parenting measures, as self-reports may be more susceptible to bias such as social desirability or low reflective capacity (Lotzin et al., 2015). Nonetheless, assessment of *prenatal attachment* has mainly focused on maternal subjective self-reports, such as maternal fetal-attachment (MFA) (Brandon, Pitts, Denton, Stringer, & Evans, 2009).

MFA self-reports comprise thoughts, behaviors, and emotions towards the future baby (Alhusen, 2008; Condon & Corkindale, 1997; Cranley, 1981; Muller, 1990). Findings on its associations with parenting have been somewhat inconsistent. On the one hand, high MFA has been linked with secure maternal adult attachment style (Alhusen, Hayat, & Gross, 2013), higher self-reported postnatal bonding (de Cock, 2017; Rossen et al., 2016), higher self-reported EA at 18 months (Punamäki, Isosavi, Quota, Kuittinen, & Diab, 2017), and more sensitive parent-infant interaction (Alhusen, 2008). On the other hand, high MFA did not predict either the mother's observed interactive behavior with her infant (Dau, Callinan, & Smith, 2019; Thun-Hohenstein, Wienerroither, Schreuer, Seim, & Wienerroither, 2008), nor maternal sensitivity to infant communication nor mind-mindedness capacity (Arnott & Meins, 2007; Walsh, 2010). Furthermore, there are some indications that highly positive MFA may imply more the felt importance of the fetal relationship rather than its security (i.e., actual emotionally signaled availability), at least among high-risk mothers (see also Walsh, 2010). For example, Lewis (2006) found that mothers whose previous children were taken into foster care, had stronger MFA in their next pregnancy as compared to mothers who had not previously lost custody of their children.

Taken together, developing direct observational measures for prenatal maternal-fetal relationship seems warranted, to allow delineating the actual, emotionally and behaviorally observable precursors of the affiliative relationship between the mother and child (Brandon et al., 2009). As a response, this study presents an alternative conceptualization and assessment of the prenatal relationship: The prenatal EA perspective, with focus on the observable maternal emotional and behavioral indicators of prenatal attachment with the baby. In order

to validate the novel approach, we examine the associations of prenatal EA with maternal adult attachment and reflective functioning, as both are core contributors of maternal-fetal and mother-infant relationship.

One of the most significant factors affecting the mother's relationship with the baby during pregnancy are her own attachment representations. These internal representations of the self and significant others in close relationships are thought to guide maternal perceptions, interpretations, emotions, and behavior in close relationships, including with the infant (Main, Kaplan, & Cassidy, 1985; Stroufe & Fleeson, 1986). The Adult Attachment Interview (AAI) (George, Kaplan, & Main, 1985) is considered the "gold

Standard" of assessing attachment along the lines of coherence, accessibility to emotions and memories, and balance vs. biases of state of mind. Secure-autonomous adult attachment is reflected in the ability to provide coherent (i.e., internally consistent and not emotionally restricted or overwrought) narratives of one's own childhood experiences. Insecurely attached adults instead show inconsistent and incoherent narratives in AAI, including both idealization and difficulties in remembering, typical for insecure-dismissing attachment, or actively angry or vague, difficult-to-follow discourse, typical for insecure-preoccupied attachment. The third insecure adult attachment pattern, insecure-unresolved attachment, represents a local collapse in narrative coherence specifically when describing traumatic life events such as death or abuse, and has been linked with failed trauma processing (Bailey, Moran, & Pederson, 2007).

Parents with secure-autonomous attachment representations are more likely to be sensitive and supportive during interactions with their own children than individuals with insecure attachment (see for a meta-analysis, van IJzendoorn, 1995), and they are less likely to show depressive symptoms than insecurely attached individuals (Bakermans-Kranenburg & van IJzendoorn, 2009; Lyons-Ruth, Lubchik, Wolfe, & Bronfman, 2002; Smith-Nielsen et al., 2015). Mother's secure-autonomous attachment may also buffer against parenting problems among those mothers who show depressive symptoms (Flykt, Kanninen, Sinkkonen, & Punamäki, 2010; McMahon, Barnett, Kowalenko, & Tennant, 2006). Secure-autonomous maternal attachment is also associated with higher maternal postpartum EA (Biringen et al., 2014) and with higher self-rated MFA during pregnancy (Alhusen et al., 2013). In this study, we examine whether maternal secure-autonomous attachment is similarly linked with our new measure of mother's prenatal emotional availability.

Mother's prenatal reflective functioning

A body of evidence also highlights the relevance of explicit, narrative psychological processing called parental mentalization (operationalized as

reflective functioning, RF) on adaptive preparation for motherhood (Slade, Cohen, Sadler, & Miller, 2009). Parental RF is defined as the verbally expressed imaginary capability of understanding the separation between the parent's and the child's minds, and how mental states, i.e., feelings, thoughts, intentions and desires, are linked to behavior (Slade, 2005). Prenatal RF is a distinct and unique aspect of parental RF, referring to the mother's prenatal ability to imagine the future, outside of her current understanding of herself, her spouse, and her situation and without linking the understanding to direct perceptions of the child (Slade et al., 2009). Prenatal RF is measured with a semi-structured interview probing about the mother's emotional experience of being pregnant, and her thoughts and fantasies about the baby (Slade, Patterson, & Miller, 2007). In addition, the interview aims to capture mother's representations about herself as a mother and the capability of anticipating the baby's needs in the future.

The role of prenatal RF for early parenting and child outcomes has been verified in studies showing that low prenatal RF is associated with various psychosocial risks, including psychiatric disorders, low SES, and substance misuse (Smaling et al., 2015; Suchman, DeCoste, Leigh, & Borelli, 2010), and with more aggressive infant behavior (Smaling et al., 2017). Mothers with higher prenatal RF have instead shown to exhibit more positive behavior during free-play, teaching tasks, and the Still Face Paradigm with their 6-month-old children (Smaling et al., 2016). Furthermore, in the postnatal period, parental RF capability has been linked with maternal sensitive interactions with the infant and the child's later attachment security (For a review, see Camoirano, 2017). In this study, we test whether mother's higher prenatal RF is also associated with her higher prenatal EA towards the baby.

The Present Study: Prenatal Emotional Availability

Taken together, direct assessment of the developing emotional relationship between a mother and the baby already during pregnancy is clinically warranted for early identification of women in need of preventive parenting support (Barlow, 2018). Thus far, EA has been assessed from dyadic postpartum interactions involving a direct contact with the child, and is mostly based on nonverbal cues, via facial expressions, gestures, postures, and tone of voice, indicative of emotional connection (Biringen & Easterbrooks, 2012). Based on this, we aim to extend the EA perspective into pregnancy, and examine the emotional precursors of maternal attempts to emotionally connect with the fetus-baby. Optimally, we would expect to see maternal sensitivity, i.e., the

capability of expressing and attuning positive affect as well as verbal communication towards the fetus baby (when prompted) as well as non-hostility, i.e., the capability of regulating negative emotions and stress when addressing communication to the fetus-baby.

The present study aims to describe and study the validity of a new observational measure developed to assess the prenatal EA comprising prenatal sensitivity and non-hostility towards the unborn baby. To validate the scale, we compare the ratings of prenatal EA with ratings on previously validated prenatal measures highly relevant for postpartum parenting: Prenatal adult attachment and reflective functioning (RF). The hypotheses are that 1) low prenatal sensitivity and non-hostility are more common among insecurely than securely attached women, and 2) low sensitivity and non-hostility are related to lower levels of prenatal RF.

Method

Subjects

The sample consisted of 45 women from a community sample in four well-baby clinics in Lahti (a city in Southern Finland), who were screened positive for depressive symptoms using the Edinburgh Postnatal Depression Scale (EPDS) (Murray & Cox, 1990) between 22 - 31 gestational weeks. General sample characteristics are shown in Table 1. SES were assessed by the level of education from one (primary school) to four (doctoral degree). Over half had either high school or trade school or university degree of education. Most were married or co-habiting, and over half were first-time mothers. The average of depressive symptoms was 12.40, indicating that a high number of mothers had high levels of depressive symptoms.

Table 1
Maternal demographic information

	Participants	
	%	n
Marital status		
Married	40	16
Co-habiting	50	20
Single	10	4
Number of children		
First time mother	66.7	30
One previous child	22.2	10
Two or more children	11.1	5
Education		
Elementary school	10	4

High school/Trade	47.5	19
University degree	32.5	13
Doctoral degree	10	4
	M	*Sd*
Maternal depressive symptoms (EPDS)	12.40	3.52

Note. Sample size varies between 40-45 due to missing information.

Procedure

The mothers were invited by their well-baby clinic nurse in their regular prenatal check-up to participate in the study project called the "Baby Magic." The study was run by a non-profit third sector organization (Diacony Foundation of Lahti), and funded by the Finnish Slottery Machine Foundation 2011-2015. Inclusion criteria included scoring nine or higher on depressive symptoms in EPDS. The purpose of the project was to develop intervention services for mothers with prenatal depressive symptoms (Salo et al., 2019). The current study represents the baseline measurement phase of the larger project where no intervention or randomization to interventions had yet been performed. If the mothers' scores were beyond 13 (considered a clinical cut-off for severe depression in most postnatal samples [Mathey, Vedova, & Agostini, 2017]) they were additionally guided to appropriate communal adult psychiatric services unless they already had a contact. The mothers were invited to participate in the study between April, 2012 and May, 2013. About 92% of the invited mothers agreed to participate. The enrollment lasted for a previously designated time. If the mother was married or co-habiting, the fathers were present during the first meeting. The ethical committee of the City of Lahti approved the study plan. All parents gave their voluntary, informed consent for treatment and were informed of their rights to leave the study or treatment at any time.

Measures

Edinburgh Depression Scale (EPDS). The EPDS (Murray & Cox, 1990) is a widely used and reliable 10-item self-report for the assessment of symptoms of depression, including feelings of happiness and sadness, fears, self-blame, sleeping problems, and thoughts about harming oneself during the previous week. It is commonly used both pre-and postpartum to screen for depression (Venkatesh et al., 2016). In the Finnish maternity and well-baby clinics the cut-off score 13 is used for probable major

depression, and cut-off score nine for probable depression (Hakulinen-Viitanen & Solantaus, 2016**)**. Cronbach's alpha was .85.

Emotional availability—Prenatal version (Pre-EA). Observation of prenatal emotional availability was done in a setting designed by Ann Jernberg and her colleagues, the Prenatal Marschak Interaction Method (MIM) (Jernberg, Wickersham. & Thomas, 1985; Salo & Booth, 2019). Here the mother is asked to perform four activities with the fetus: (1) Draw a picture of yourself and the baby, (2) Play a music box to your baby, (3) Tell your baby something without using words and then do the same with words, and (4) Tell your baby about the people s/he will meet after birth (Salo & Booth, 2019). The goal is to pull out affective responses towards the fetus, see if mother is able to connect, e.g., make an effort of attuning, touching and guiding speech, gestures, and affects towards the fetus while performing the tasks. In other words, the goal is not to rate the actual performance or verbal content but rather the style and affective-behavioral way the mother is doing the tasks, In practice, mother is asked to read the Prenatal MIM tasks from cards the experimenter gives. Experimenter stays in the same room but stays neutral and refrains from commenting. The videotaped situation with the four MIM task lasts about 15 minutes.

The postpartum EA is based on a free play or semi-structured videotaped interactions that are scored on six scales (Biringen, 2008). They comprise parental sensitivity, structuring, non-intrusiveness and non-hostility, child responsiveness, and child involvement and are rated on a 7-point Likert-type scale. The prenatal EA version comprises two maternal scales, developed in collaboration with Prof. Biringen (Salo, Flykt, & Biringen, 2016): The maternal sensitivity and non-hostility.

In assessing the prenatal EA, most focus is on the affective and behavioral cues, not on the words or the content of the actual performance on the MIM tasks. For example, regardless of *what* the mother says in the task where she is asked to tell the baby about people he or she will meet after birth, the ratings of maternal prenatal sensitivity assessment focuses on the overall affective quality and attunement towards the fetus, evidenced for example by touching the tummy and commenting on the baby's movements, and responding to them with positive affect. Thus, being rated as highly sensitive (seven) would require expressions of positive affect in facial expressions (vs. a very still-face expression), as well as gentle touching of the tummy, using hands to hold the tummy, stroking the tummy, or turning head towards the tummy while talking to the fetus (vs. not touching one's tummy or not directing attention towards the baby while performing the MIM tasks). Overall positive, open, warm, lively, and responsive emotional communications are taken into account. Specific emotional expressions with a reciprocal intention, e.g., waiting for a response from the fetus as evidenced by movement, are considered

markers of good sensitivity. In the middle range of scores (five) maternal affect is bland. Mother is somewhat responsive in the sense of aiming to feel if the fetus responds by movement or just reflecting if the fetus is quiet. In lower scores, there is either a pseudo-quality in maternal affect, i.e., it is overly positive and bright and lacks authenticity (four), or depressed and withdrawn affect with little orientation (psychological or behavioral) towards the fetus (three). In the lowest end of scores (one and two) there are awkward expressions such as frowning or odd, childlike giggling, or complete shutting down.

Maternal non-hostility is characterized by the ability to regulate one's negative emotions. It is inferred by the absence of hostile responses, and overtly or covertly hostile behavior. The most hostile adult openly exhibits his or her hostility in facial expression and voice, such as frowning, using a raised, irritated tone when addressing the fetus, or making critical or sarcastic comments about the fetus (e.g., "you big bully, why do you kick mommy"). Signs of covert hostility include showing impatience or boredom such as repeated yawning, making negative comments about the testing situation, or other negative comments, not necessarily directed at the child. The high points refer to lack of any hostile qualities (seven). In the middle range of scores there are some subtle signs of (five) hostility. Lower than midpoint scores refer to clear examples of covert hostility (four) where the mother has occasional negative expressions in face, posture, and touch (tensed eyebrows, angry mouth, repeated yawning, sarcastic comments about the MIM tasks etc.) even if trying to mask them behind laughter. In lower scores, there are some to several expressions of clear anger or irritability, e.g., negativity in the face, posture, or touch (such as poking the fetus), critical remarks, minimizing the situation or the fetus, making sarcastic or negative comments, warranting scores three, two, or one, respectively.

Both prenatal EA scales were assessed with a seven-point Likert-type scale with high scores indicating more sensitivity or non-hostility. Additionally, a bottom-up scoring sheet with 29-metric was modified from the original EAS forth sensitivity and non-hostility scales and the top-down scores were checked using this metric. Two trained raters reliable in EAS forth edition and trained by Z. Biringen scored the tapes (first and second author), with five tapes checked with the method developer (Z.B). Interrater reliability was (Pearson's r) .89 for sensitivity, and .84 for non-hostility.

Adult Attachment Interview. The mothers' childhood attachment representations regarding their own parents were assessed with the Adult Attachment Interview (Main, Goldwyn & Hesse, 2003). The semi-structured interview explores how individuals describe their childhood

relationships to primary caregivers, and how these experiences are considered to influence one's developmental history and current personality. The interview includes questions of attachment-activating incidents such as being hurt, upset, or separated from the caregiver, as well as questions of loss and trauma. In addition, participants are asked about their fears, hopes, and worries related to the child-to-be. Probable experiences in relation to caregivers and states of mind regarding attachment and trauma/loss are each scored on a scale ranging from zero to nine (for a detailed account of the coding system, see Hesse, 2008). Audiotaped narratives were transcribed verbatim and then classified to four categories: secure/autonomous (F), insecure/dismissing (Ds), insecure/preoccupied (E) and unresolved/disorganized in relation to loss or trauma (U/d). The interviews classified as U/d received a secondary classification of one of the organized categories (F, Ds, or E). When a transcript did not fit any of the above categories, it was categorized as a CC (cannot classify). When a CC transcript was also assigned a U/d rating, the U/d was used as the primary classification.

The interviews were classified by the second author, a reliable coder trained by A. Broberg and T. Ivarsson (AAI institute in Gothenburg, 2011). For interrater reliability, the third author (trained by Broberg and Ivarsson in AAI institute in Oslo, 2012) analyzed 20% of the cases. The interrater reliability (Cohen's Kappa) was .69, which is considered as good level of agreement (Fleiss, 1981). With the two cases rated differently, the classification was negotiated and then checked with a third reliable coder. As instructed by the AAI reliability training, every transcript with a U/d or CC classification was double-checked by the second coder. Additionally, six other transcripts were re-read by the second author to ensure reliable classification. Finally, the AAI trainers (Broberg and Ivarsson) were consulted in the classification of a CC case without a primary U classification.

The Pregnancy Interview (PI-RF). The Pregnancy Interview (PI-RF) is a semi-structured clinical interview with 22 questions regarding a variety of mental states related to mothers' emotional experience with pregnancy and her expectations, hopes, and fears regarding her future relationship with the child, e.g., "Do you think you have a relationship with the baby?" The signs of explicit mentalizing classified from the interview include four categories: a) the parents' awareness of the nature of different mental states, b) clear and exact intention to understand mental states that underlie behavior, c) ability to recognize developmental aspect of mental states, d) considering mental states in relation to the interviewer. The scoring system is based on the same system used to score postpartum PDI-RF (Parent Development Interview) (Slade, Bernbach, Grienenberger, Levy & Locker, 2005), with modifications to pregnancy

(Slade et al., 2007). The interview takes approximately 1-1.5 hours to administer.

In evaluating prenatal RF, audiotaped narratives were transcribed verbatim and scored for parental RF. Freshness and spontaneity of reflections about specific interaction episodes are taken into account and the importance of episodic memory is emphasized. Generalized expressions, opinions, or clichés are not considered signs of true RF. The number of indications of true reflectiveness found in the transcribed narrative is the basis for assigning the overall score. The greater the number of specific and varied indications of RF, the higher the score on an 11-point scale, with a score of -1 indicating a rejection of RF, and scores six-nine representing exceptionally high ability for RF. The interviews were scored by two reliable raters trained by Arietta Slade and her team (first and last author), and the interrater reliability assessed with 20% of the interviews was .95 (Pearson's r).

All the observations and interviews were rated blindly to ensure the objectivity of the raters.

Data Analysis

Missing values for study variables were replaced with Expectation Maximization (EM). We first examined the associations between background characteristics (level of depressive symptoms, educational level, marital status, and parity) and study variables (prenatal RF, prenatal EA sensitivity and nonhostility, and adult attachment), using Pearson's correlations, Students' t-tests and Chi square tests depending on whether the variables were continuous or categorical. For the purposes of these analyses, categorical variables (attachment, educational level, parity, and marital status) were dichotomized to maintain adequate cell sizes (secure/insecure attachment, low/high educational level, primi/multiparous families, and partnership/single parent).

To answer the first research question, whether mother's adult attachment style was associated with prenatal EA sensitivity and EA non-hostility, we used a Multivariate ANOVA. The analyses were run both with four-way (Secure-autonomous, Insecure-dismissing, Insecure-preoccupied, and Unresolved/CC) and 3-way classifications (Secure-autonomous, Insecure-dismissing, and Insecure-preoccupied, where U categories with a secondary organized classification where forced into the main organized strategy. U-cases with a secondary CC classification were omitted from 3-way analyses). Second, we assessed whether prenatal RF was associated with prenatal EA sensitivity and non-hostility by using a Multivariate ANOVA (SPSS GLM function allowing the customization

models so that continuous variables can be used as predictors). This method was chosen to diminish the number of analyses due to small sample size.

Results

Descriptive Statistics. The means, standard deviations and observed ranges of prenatal EA sensitivity and non-hostility, prenatal RF and the distribution of adult attachment classifications are presented in Table 2. About a third of mothers received a primary secure-autonomous (F) classification, and about a fourth were classified as insecure-dismissing (Ds), including, interestingly, three mothers with DS4 sub-category indicating fear of loss towards their (unborn) child. About 13% of the sample were classified as insecure-preoccupied (E). The prevalence of insecure-unresolved (U/d) pattern was 26.3% and one mother (2.6%) had a primary placement in cannot classify (CC) category without U. Three other U mothers had CC as their secondary classification but were placed in the U category due to the primary classification. Three of the U mothers had E as their secondary classification, two had F and one had Ds. The mean levels of prenatal EA sensitivity and non-hostility and prenatal RF and were very low compared to normative samples (five is indicated as typical for normative samples for RF scale and 5.5-6 for postnatal EA scales), but the estimates ranged from very low to normative range.

Table 2.
Frequencies, Means, and Standard Deviations of Study Variables

	n (%)	*M*	*SD*	Range
AAI: Secure-autonomous	13 (34.2 %)			
AAI: Dismissing	9 (23.7 %)			
AAI: Preoccupied	5 (13.2 %)			
AAI: Unresolved/Cannot Classify	11(28.9 %)			
PI		2.91	1.41	-1 - 5
MIM Sensitivity		3.41	1.21	1 – 5.5
MIM Non-hostility		3.79	1.08	2 - 6

Table 3 shows the associations between background factors (educational level, parity, marital status, and level of depressive symptoms) and study variables (prenatal RF, prenatal EA sensitivity and non-hostility, and adult attachment). Only the association between maternal two-way attachment classification and educational level was

significant, indicating that securely attached mothers more often had higher educational level. Due to small sample size and lack of associations between background factors and EA variables, covariates were not used in the analyses.

Table 3.
Associations between background and study variables

	Educational level (high/low)		Parity (primi/multiparous)		Marital status (partnership/single)		Depressive symptoms	
	t(43)	*p*	*t* (43)	*p*	*t*(43)	*p*	R	*p*
RF	-1.16	.12	0.14	.89	-0.54	.59	-.07	.63
Sensitivity	-1.92	.06	-0.69	.50	-0.52	.60	-.11	.48
Non-hostility	-1.19	.24	-0.57	.57	0.66	.51	-.10	.52
	X^2	*p*	X^2	*p*	X^2	*p*	*t*	*p*
Adult attachment (secure/insecure)	5.96	**.015**	1.25	.26	0.50	.48	-0.94	.35

Main Results

Our first question was whether mother's prenatal adult attachment was associated with her prenatal emotional availability (sensitivity and non-hostility). The results presented in Table 4 showed significant associations between four-way adult attachment classifications and prenatal EA, $F_{\text{Wilk's Lambda}}(6, 66) = 2.27$, $p = .047$, $\eta^2 = .17$. Univariate tests showed that mother's adult attachment was associated both with her prenatal EA sensitivity and non-hostility. Related to prenatal EA sensitivity, according to our hypothesis, post-hoc tests (Tukey) suggested that mothers with secure-autonomous attachment differed significantly from mothers with dismissing ($p = .013$), and unresolved ($p = .044$) attachment. The difference to preoccupied attachment group was not significant but was to the expected direction ($p = .099$). No significant differences emerged between the insecure attachment groups. Related to prenatal EA non-hostility, despite significant univariate tests, post-hoc tests indicated no significant group differences, although secure-autonomous attachment group showed a marginally higher level of non-hostility than the dismissing attachment group ($p = .067$), and the differences to other attachment groups were to the expected direction. No significant differences emerged between the insecure attachment groups.

Concerning the three-way attachment classifications, there was again a significant effect of mother's attachment on prenatal EA, $F_{\text{Wilk's Lambda}}(4, 60) = 3.60$, $p = .011$, $\eta^2 = .19$. Univariate tests confirmed our hypothesis that mother's secure-autonomus attachment was associated with higher levels of both prenatal EA sensitivity and non-hostility than mother's insecure attachment. Related to prenatal EA sensitivity, post-hoc tests (Tukey) showed that mothers with secure-autonomous attachment differed significantly both from mothers with dismissing ($p = .01$) as well as preoccupied attachment ($p = .011$). Similarly, related to EA non-hostility, secure-autonomous mothers differed significantly from mothers with dismissing ($p = .032$) and preoccupied ($p = .015$) attachment.

Table 4.
Associations between mother's adult attachment and her prenatal RF and prenatal EA sensitivity and non-hostility

	Secure-autonomous		Insecure-dismissive		Insecure-preoccupied		Insecure-unresolved				
	M	Sd	M	Sd	M	Sd	M	Sd	F (3,34)	*p*	η^2
4-way classification											
Prenatal EA sensitivity	4.31[a]	0.29	2.83[b]	0.35	3.00[(b)]	0.47	3.13[b]	0.31	4.64	.008	.29
Prenatal EA non-hostility	4.46[a]	0.28	3.33[(b)]	0.34	3.20	0.45	3.60	0.30	5.96	.035	.22
3-way classification									F (2,31)	*p*	η^2
Prenatal EA sensitivity	4.13[a]	0.26	2.85[b]	0.32	2.83[b]	0.33	-	-	7.05	.003	.31
Prenatal EA non-hostility	4.40[a]	0.24	3.40[b]	0.29	3.23[b]	0.31	-	-	5.78	.007	.27

Note. F represents Univariate F-values. [ab] groups differ from each other in Tukey post-hoc tests [(b)]Group differs marginally (<.10) from group [a]

Our second question was whether mother's prenatal RF was associated with her prenatal EA sensitivity and non-hostility. The results show significant associations between prenatal RF and prenatal EA variables, $F_{Wilk's\ Lambda}(2,42) = 13.41$, $p < .001$, $\eta^2 = .39$. Consistent with our hypothesis, univariate tests confirmed that mothers with higher prenatal RF displayed higher prenatal EA sensitivity, $F(1,43) = 20.49$, $p < .001$, $\eta^2 = .32$ and non-hostility, $F(1,43) = 25.51$, $p < .001$, $\eta^2 = .37$.

Discussion

The present study aimed at validating a new observational assessment measure of maternal emotional availability towards her baby during pregnancy. The clinical and pragmatic goal was to develop a new method for both assessment and intervention for mothers suffering from prenatal depressive symptoms, a group known to be at high risk for later parenting problems (Field, 2011). The aim was to extend the previous work based mostly on self-report measures of prenatal maternal-fetal attachment (Alhusen, 2008) by developing an objective observational measure rated by a clinician.

The results supported the first hypothesis that mothers with secure-autonomous adult attachment representations showed higher observed prenatal EA, i.e., maternal sensitivity and non-hostility, than mothers with insecure attachment representations. Similarly, the results supported the second hypothesis that higher levels of maternal prenatal RF were related to higher observed prenatal EA. These results lend support for the validity of measuring direct emotionally expressed EA towards the fetus-baby, as a related, but yet distinct, construct from the mother's adult attachment representations and her verbal reflections on the future child and relationship with the child.

The main findings support the construct validity of Pre-EA, as mothers with secure-autonomous attachment representations and high reflective capacity also showed more positive and less negative emotions and willingness to communicate in the interaction with the fetus baby. As such, the present study extends previous work on the development of emotional bond between the mother and the child during pregnancy, which has mainly relied on subjective self-reports on attachment (Alhusen, 2008). It is important to note that direct, observable forms of emotional connection can be measured already during pregnancy, thus also opening new avenues of preventive relational interventions.

Altogether, there was a high number on insecurely attached mothers in this sample (65.8 %). This is generally in line with other studies among mothers with depressive symptoms indicating the range of 40% (Smith-Nielsen, et al., 2015) to 60% (McMahon et al., 2006). In our sample, also the number of mothers with unresolved or cannot classify attachment classifications (28.9%) was much higher than previous studies have

generally found in non-clinical pregnant mothers (Slade, Grienenberger, Bernbach, Levy & Locker, 2005). This may reflect the clinical nature of the present sample, as our results are more in line with studies using depressed populations (Bakermans-Kranenburg & van IJzendoorn, 2009), such as the McMahon et al. study (2006) who also found that over 20% of their clinically depressed mothers had unresolved attachment. As adult attachment theory predicts, vulnerabilities from one's own attachment history may have long-lasting influences on maternal sensitive interactions (van IJzendoorn, 1995), and this may be possible to see already during pregnancy.

In previous studies, a mother's secure-autonomous attachment has been shown to act as a buffering factor in terms of more sensitive interaction with the child among depressed mothers (Flykt et al., 2010; McMahon et al., 2006). The present study extends these findings into pregnancy in that here mothers with depressive symptoms, but with a secure-autonomous attachment, were also more able to express positive emotions and less hostility towards their unborn child. It is to be noted that the effect size of adult attachment on prenatal EA was relatively large, indicating that insecure attachment experiences may clearly endanger the early development of mother-infant relationship, which is vital to take into account in clinical work during pregnancy.

Our findings regarding the prenatal RF are also generally consistent with previous studies finding a link between postnatal RF and observed sensitive interaction with the child (Camaraino, 2017). As depressive symptoms may be especially harmful through biasing cognitions, it is of special relevance that in our study the mean level of prenatal RF was also very low (2.8). This is in line with previous studies showing average parental RF scores ranging from 2.4 to 3.3 with clinically referred samples (Pajulo et al., 2012; Schechter et al., 2008; Suchman et al., 2010), and 2.1 in adult psychiatric depressed patients (Fischer-Kern et al., 2013). Our results, which also showed large effect size, suggest that the difficulties depressed mothers have in their reflective functioning may have negative associations with the emotional availability system with the child starting already during pregnancy. Targeting both these attachment-based mechanisms—reflective functioning as well as direct emotional availability—operating in related, yet distinguishable ways may enhance the potential efficacy of early prevention. As one is a verbal and the other a largely non-verbal mechanisms, it may be important to offer both verbal and body-oriented therapy elements during pregnancy.

Taken together, clinically, our results show that the affective system of emotional availability is operating already during pregnancy. Our results are line with experimental studies showing that attentional

processing of infant-related emotions may be disturbed with prenatally depressed mothers (Pearson, Lightman, & Evans, 2011). Making maternal emotions and related attuned behaviors towards the fetus baby's interactive signals (e.g., movements, rhythms) the target of early preventive work may give new possibilities of preventing relational disturbances common among mothers with depressive symptoms over the transition to parenthood. Most prenatal interventions to date focus only on depressive symptom reduction based on the assumption that reducing depression would decrease its harmful consequences on parenting (Field, 2017; Lefkovics, Baji, & Rigo, 2014). Yet, reducing those symptoms alone does not appear to lead to improvements in parenting or in infant well-being and development (Forman et al., 2007). Subsequently, it has been suggested that early interventions should also focus directly on enhancing optimal mother-infant relationships already during pregnancy and beyond (Field, 2011; 2017; Lefkovics et al., 2014). According to our results, this may be especially relevant when the mother has, in addition to depressive symptoms, insecure adult attachment and low RF.

The main limitation of the study is its small sample size, and the results need to be verified using a larger sample. The use of multiple qualitative measurements including transcribed interviews and videotaped recordings may nevertheless pose practical challenges for larger studies. The results also need to be confirmed by using a non-clinical sample.

Despite these limitations, our study adds to the existing literature on emotional availability, adult attachment and RF by extending the focus into pregnancy. In clinical work, strengthening the actual, felt, and expressed emotional relationship to the fetus and treating the baby as a subject has long been considered a relevant part of both pre- and postnatal parent-infant psychotherapies (Baradon, Biseo, Broughton, James & Joyce, 2016). What our results may suggest, is that in terms of the developing emotional, attachment-based connection during pregnancy, considering the emotionally expressed side of the early bonding in addition to verbal subjectively experienced mother-fetal attachment may be clinically important (Pisoni et al., 2014). Moreover, the risk characteristics of the sample make the findings relevant for clinical application, including the development of parenting prevention and intervention programs. In future studies using a normative sample and including postnatal measures will be important to further study the validity and clinical relevance of the present findings.

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