Original Research

# Associations between Prenatal Factors and Self-Reported Emotional Availability at 3- and 6-Months Postpartum

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**Abstract**

Positive perceptions of pregnancy are associated with better postpartum outcomes, including stronger relationship with baby. Although better self-reported emotional availability (EA-SR) is associated with greater attachment security with infants, research has not yet explored the relationship between prenatal maternal factors and EA-SR. The aim of the study was to explore the associations between prenatal variables (adult attachment, shame, compassion) and EA-SR at 3- and 6-months postpartum. A cross-sectional survey design based on a convenience sample of pregnant Australian women completed the survey at three time points: pregnancy (3rd trimester, n = 133), and again at 3- (n = 65) and 6-months (n = 40) postpartum. Five, 5-step, hierarchical multiple regressions revealed the model (mean maternal age/prenatal attachment/shame/compassion/psychological adjustment) significantly explained 62% in self-reported maternal hostility, 53% in self-reported child involvement, and

52% in self-reported mutual attunement, at 6-months postpartum. Higher levels of prenatal internal shame were related to less self-reported child involvement (p = 0.04), and more self-reported maternal hostility (p = 0.03), at 3-months postpartum. More prenatal giving compassion was associated with better self-reported affect quality at 3- (p = 0.01) and 6-months postpartum (p = 0.01), and less self-reported hostility (p = 0.02) at 6-months postpartum. Greater understanding of the relationship between prenatal factors and EA-SR may help enhance prenatal care pathways to support women and families at risk of adverse postpartum outcomes.

**Keywords**
Mothers; prenatal; compassion; shame; self-reported emotional availability

## 1. Introduction

A substantial body of literature shows the quality of the emotional relationship (emotional availability [EA]) that develops between a mother and her infant can foster positive cognitive, social, emotional, and developmental outcomes in the child [1-3], up to 7 years later [4]. EA has been primarily assessed by an observational assessment – the Emotional Availability Scales (EAS) – six observational scales measuring the parent's and infant's contribution to the relationship [5, 6]. More EA in the mother-infant relationship is associated with better maternal and infant outcomes: better child attachment security, stronger emotional regulation, better expressive language abilities, greater empathy, and better preschool social skills [7-9]. As the EAS is based on observation, it provides limited information on how parents perceive the emotional availability in the relationship with their infant [10]. A large body of research shows that mother's positive perceptions of her pregnancy is associated with better psychological adjustment in the postpartum period, and positive parenting behaviours [11, 12]. Substantial research shows that the mother's negative perception of her psychological health is associated with more perinatal psychological distress, delay in help-seeking [13, 14], and greater perceived difficulties in bonding with their baby [14]. Very limited research exists on the mother's perception of her relationship with her baby (self-reported emotional availability) and her psychological adjustment to motherhood. Greater insight into the factors that are associated with greater self-reported emotional availability may identify better ways to support women at risk of suboptimal postpartum outcomes for her, her baby, and her family.

Adult's self-reported attachment security is consistently related to more positive parenting behaviours, and insecurity with more negative parenting behaviours [15]. In a study of 41 mothers and their 12-month-old infants, mothers with a secure adult attachment pattern spent significantly more time mutually attuned to their infant's positive and negative states, less time mis-attuned to their infant's states, and a greater ability to restore mis-attuned moments, than those mothers with a self-reported insecure (avoidant/anxious) adult attachment pattern [16]. Research on self-reported attachment and observational EA shows that mothers with an avoidant attachment are shown to adopt a predominantly directive or controlling parenting style, and those with an anxious attachment adopting an inconsistent, angry, or intrusive parenting style [16-18]. There is no research at present that explores the relationship between self-reported attachment style and self-

reported emotional availability. Examining these links may help to better support women at risk of adverse postpartum psychological outcomes, and suboptimal relationship with her baby.

Mothers who report more shame in their mothering also report higher psychological distress [12, 19, 20]. Even though more psychological distress is related to greater difficulties in bonding with baby [21-24], the relationship between mother's shame and self-reported emotional availability with baby is not yet known. Shame – defined as perception and evaluation of the self as bad, unworthy, or inferior – is strongly related to psychological symptoms in adults, as well as less openness and willingness to seek help [25-28]. In parents of older children, more shame is associated with greater use of controlling and intrusive parenting practices [1, 29]. In mothers, self-reported difficult childbirth experiences [30] and breastfeeding experiences [31-34] is related to more shame [20, 35-38]. Exploring the association between shame and self-reported emotional availability may help to identify clinical pathways to better support women develop an optimal relationship with her baby.

Gilbert [39, 40] distinguishes between two types of shame – *internal shame* (negative evaluation of the self as bad, inferior, worthless) and *external shame* (others see the self negatively, and may reject, attack, criticise, or exclude) – which may have different implications for self-reported EA. A meta-analysis showed external shame is more strongly related to depression than internal shame [25]. It may be because support from others – when a woman becomes a mother – is crucial for better psychological adjustment [41]. Being shamed by others – external shame – triggers defensive reactions (anger, withdrawal, submission) which may, theoretically, adversely affect the mothers' capacity to emotionally 'read' and attune to the nonverbal cues of her infant [29, 42, 43]. Gaining insight into the relationships between types of shame and self-reported emotional availability may provide unique pathways to identify and support women becoming mothers.

Even though infant developmental outcomes are shown to be influenced by prenatal maternal factors [44], there is almost no research on the relationships between prenatal factors and postpartum EA. Some research shows prenatal depression is associated with lower levels of observational EA at 12-months postpartum [17], but there is no research on self-reported emotional availability. Research on *Compassion-Focused Therapy* (CFT) [45, 46] in parenting may be a promising avenue for gaining insight into optimising the mother-infant relationship. Greater psychological flexibility and compassion is associated with better attunement, more warmth, and lower hostility in parents of older children [1, 3, 29, 47]. Postpartum intervention studies show that mothers with higher scores on mindfulness and self-compassion also report lower levels of postpartum psychological distress, higher breastfeeding satisfaction, and better attachment with their infant [47-52]. Even though recent prenatal research shows prenatal mindfulness-based interventions reduce prenatal distress [53-57], the links between prenatal mindfulness factors and self-reported emotional availability is not yet known. As the relationship between her mother and baby is acknowledged to develop prenatally – and prenatal maternal factors are a strong predictor of postpartum adjustment to motherhood outcomes [58] – more research on the relationships between prenatal levels of shame, compassion, and EA may help to provide insights into ways to support an optimal mother-infant relationship.

### 1.1 Present Study

The aim of this study was to extend previous research by investigating whether self-reported prenatal (3rd trimester) variables – adult attachment, internal and external shame, psychological flexibility, compassion, and psychological adjustment – are associated with self-reported maternal emotional availability (EA-SR) at 3- and 6-months postpartum. Examining the links between prenatal factors and EA-SR may provide further insights into potential associations and intervention points that may enhance women's psychological adjustment to motherhood and, in turn, her relationship with her baby. Based on previous research [29, 47, 59] – and guided by a compassion-focused approach grounded in the evidence base of *Compassion-Focused Therapy* (CFT) [45, 46, 60] – the aim of this study was to explore the associations between prenatal factors and self-reported emotional availability.

## 2. Methods

### 2.1 Participants

Participating Australian pregnant women were from the Compassionate Mums (CM) study. The CM project was advertised online via relevant pregnancy and baby websites and social media pages. Participants were required to be in their 3rd trimester of pregnancy, with an option to receive an email invitation to complete the survey at 3-months postpartum and again at 6-months postpartum. A sample size of 97 was required to detect a medium effect size [61]. Of the 220 women who completed the online consent form, 133 completed the pregnancy survey, 63 the 3-months survey, and 40 the 6-months survey. All procedures performed in studies involving human participants were in accordance with the ethical standards of The University of Queensland Human Research Ethics Committee (Reference Number: 2018001332). Informed consent was obtained from all participants in the study. Demographic and sample characteristics are shown in Table 1.

**Table 1** Demographic and sample characteristics for the participants at Time 1: Pregnancy (n = 133), Time 2: 3-months postpartum (n = 63), and Time 3: 6-months postpartum (n = 40).

| Variables | | *M (SD)/% (n)* |
|---|---|---|
| Mother's age (mean) | Time 1 (3rd trimester) | 32.62 years (4.00 years) |
| Infant's age (mean) | Time 2 (3 months postpartum) | 13 weeks (3.6 months) |
| | Time 3 (6 months postpartum) | 24 weeks (4.6 months) |
| Relationship status | Single | 1.5% (2) |
| | Defacto/married | 98.5% (131) |
| Education status | High school | 10.5% (14) |
| | TAFE/Diploma | 15.8% (21) |
| | Degree | 36.8% (49) |
| | Postgraduate | 36.8% (49) |
| Socio-economic status | $25,000-50,000 | 7.5% (10) |
| | $50,000-75,000 | 6.8% (9) |
| | $75,000-100,000 | 24.1% (32) |
| | $100,000+ | 61.7% (82) |

| Location | Queensland | 54.5% (72) |
|---|---|---|
| | New South Wales | 15.2% (20) |
| | Victoria | 14.4% (19) |
| | Tasmania | 1.5% (2) |
| | Northern Territory | 0.8% (1) |
| | South Australia | 6.1% (8) |
| | Western Australia | 4.5% (6) |
| | Australian Capital Territory (ACT) | 3% (4) |
| Planned pregnancy | Yes | 85% (113) |
| | No | 15% (2) |
| Fertility treatments | Yes | 12.8% (17) |
| | No | 87.2% (116) |

| Variables | | M (SD)/% (n) |
|---|---|---|
| Number of children | None | 43.6% (58) |
| | One | 36.1% (48) |
| | Two | 12.8% (17) |
| | Three | 6.8% (9) |
| | Four | 0% (0) |
| | Five | 0.8% (1) |
| Pregnancy complications | Yes | 27.1% (36) |
| | No | 72.9% (97) |
| Previous perinatal loss | Yes | 42.9% (57) |
| | No | 57.1% (76) |
| Birth | Vaginal birth | 56.1% (37) |
| | Vaginal birth with intervention (forceps/vacuum) | 16.7% (11) |
| | Planned caesarean | 13.6% (9) |
| | Emergency caesarean | 12.1% (8) |
| Birth experience | 1 (Bad) | 4.5% (3) |
| | 2 | 6.1% (4) |
| | 3 | 4.5% (3) |
| | 4 | 9.1% (6) |
| | 5 | 12.1% (8) |
| | 6 | 15.2% (10) |
| | 7 (Good) | 47% (31) |
| Infant food (3 months) | Breastmilk | 78.8% (52) |
| | Formula | 4.5% (3) |
| | Breastmilk and formula | 15.2% (10) |
| Infant feeding method (3 months) | From breast (including nipple guard) | 66.7% (44) |
| | From bottle | 6.1% (4) |
| | Breast and bottle | 25.8% (17) |
| Infant food (6 months) | Breastmilk | 21.4% (9) |
| | Solid food | 2.4% (1) |
| | Breastmilk and formula | 4.8% (2) |
| | Breastmilk and solids | 52.4% (22) |
| | Formula and solids | 7.1% (3) |

| | Breastmilk, formula, and solids | 9.5% (4) |
|---|---|---|
| Variables | | *M (SD)/% (n)* |
| Infant feeding method (6 months) | From the breast (including nipple guard) | 21.4% (9) |
| | Solid food | 2.4% (1) |
| | From the breast and bottle | 14.3% (6) |
| | From the breast and solid food | 28.0% (12) |
| | From the bottle and solid food | 9.5% (4) |
| | From the breast, bottle, and solid food | 21.4% (9) |

### 2.2 Measures

2.2.1 Prenatal Adult Attachment

Prenatal adult attachment was measured by the Experience in Close Relationships – Modified (ECR-M36) [62] scale. The ECR-M36 is a 36-item self-report measure - based on the ECR [63] – but modified to measure attachment patterns in close relationships (instead of the romantic relationship). Participants are asked to rate on a 7-point Likert scale, from 1 (*disagree strongly*) to 7 (*agree strongly*), how well each statement describes their typical feelings in close relationships. The ECR-M36 produces two subscales: anxiety (18-items) and avoidance (18-items). Cronbach's α in the present study was 0.87 (anxiety) and 0.95 (avoidance).

2.2.2 Prenatal Internal Shame

Prenatal internal shame was measured by the Internalised Shame Scale (ISS) [64]. The ISS – a 30-item measure of internal shame – is designed to measure global negative evaluations of the self. Participants were asked to rate on a 5-point scale, from 1 (*never*) to 5 (*almost always*), how often they experience thoughts of feelings of this nature. The ISS has demonstrated excellent reliability and validity [65]. Cronbach's α in the present study was 0.88 (internal shame).

2.2.3 Prenatal External Shame

Prenatal external shame was measured by The Other As Shamer Scale (OAS-2) [65]. The OAS-2 is a modification of the Internalised Shame Scale to reflect external shame. Participants are asked to rate on a 5-point scale, from 1 (*never*) to 5 (*almost always*), how others see of judge the self. The OAS has high internal consistency and reliability [65]. Cronbach's α in the present study was 0.86.

2.2.4 Prenatal Psychological Flexibility

Prenatal psychological flexibility was measured by the Acceptance and Action Questionnaire-II (AAQ-II) [66]. The AAQ-II is a 7-item measure of psychological inflexibility or experiential avoidance. The scores were reversed in the present study to obtain a measure of psychological flexibility. Participants are asked to rate on a 7-point scale, from 1 (*never true*) to 7 (*always true*), how much each statement is true for them. Cronbach's α was 0.79 in the present study.

### 2.2.5 Prenatal Compassion

The three flows of compassion – self-compassion, giving compassion to others, and receiving compassion from others – was measured by the Compassionate Engagement and Action Scale (CEAS) [67]. The CEAS is a 30-measure of compassion with three 10-item subscales for self-compassion, giving compassion to others, and receiving compassion from others. Participants were asked to rate on a 10-point scale, from 1 (*never*) to 10 (*always*), the frequency of each statement. Cronbach's α in the present study was 0.84 (self-compassion), 0.78 (giving compassion to others), and 0.84 (receiving compassion from others).

### 2.2.6 Prenatal Psychological Adjustment

Prenatal psychological adjustment was measured by the Depression, Anxiety, Stress Scales – 21 (DASS-21) [68]. The DASS-21 is a 21-item measure of depression, anxiety, and stress in adults. Participants were asked to rate on a 4-point scale, from 0 (*never*) to 3 (*almost always*), how much each statement applied to them over the last week. Cronbach's α in the present study was 0.84 (depression), 0.68 (anxiety), and 0.82 (stress).

### 2.2.7 Emotional Availability – Self Report (EA-SR)

EA-SR at 3- and 6-months postpartum was measured by the Emotional Availability – Self Report (EA-SR) [10]. The EA-SR is a 36-item measure of parent's perception of the emotional availability between themselves and their baby. Participants were asked to rate on a 5-point scale, from 1 (*not agree at all*) to 5 (*totally agree*), the perceived EA within their relationship with baby. The EA-SR have adequate reliability and validity [5, 6, 69, 70]. The EA-SR subscales are associated with the EA Scales [5]. Cronbach's α was 0.66 (self-reported mutual attunement), 0.77 (self-reported affect quality), 0.80 (self-reported child involvement) 0.86 (self-reported maternal intrusiveness), and 0.71 (self-reported maternal hostility) in the present study.

### *2.3 Statistical Analyses*

All analyses were conducted using the Statistical Package for Social Sciences (SPSS) version 26 with the significance level of .05. Missing data, assumptions (normality, linearity, homoscedasticity, and multicollinearity), and descriptive statistics will be examined prior to conducting statistical tests [71]. Bivariate correlations between the prenatal variables (adult attachment pattern, internal shame, external shame, psychological flexibility, compassion, and psychological adjustment) and postpartum variables at Time 2 (3-months) and Time 3 (6-months) were assessed. Based on previous research [72, 73], mean maternal age was included at Step 1 in the regression analysis (enter method), exploring postpartum self-reported emotional availability, as a control variable. Adult attachment was added at Step 2, shame at Step 3, psychological flexibility and compassion at Step 4, and prenatal psychological adjustment at Step 5, after researching previous studies in parental psychological adjustment [3, 29, 47]. Hierarchical multiple regressions were used to determine the unique contribution of the prenatal predictor variables to EA at 3-months and 6-months.

## 3. Results

Little's Missing Completely at Random (MCAR) test was non-significant. There were no significant outliers (non-significant Mahalanobis distance test). The means and standard deviations for all the measures are shown in Table 2. The data met assumptions of normality, linearity, homoscedasticity, and multicollinearity (VIF ≤ 10, Tolerance ≥ 0.1). Although the demographic variables were explored – infant's age, relationship status, SES, education status, location, birth variables, infant variables – only maternal age was included in the regression as it was significantly associated with the EA-SR variables. *T*-tests/chi-square tests were used to compare the groups at the three time points (pregnancy, 3 months-postpartum, 6-months postpartum) to assess for the effects of attrition. No significant differences were found.

**Table 2** Descriptive statistics for the measures at pregnancy (n = 133), and 3-months (n = 63) and 6-months (n = 40) postpartum.

| Variables | Pregnancy (n = 133) | | 3 months (n = 63) | | 6 months (n = 40) | | Change | |
|---|---|---|---|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* | *M* | *SD* | *F* | *p* |
| Adult attachment | | | | | | | | |
|     Avoidance (AVOID) | 54.99 | 20.27 | 51.45 | 21.97 | 53.42 | 23.93 | 0.59 | 0.55 |
|     Anxiety (ANX) | 53.67 | 20.52 | 49.87 | 20.37 | 54.94 | 26.07 | 0.89 | 0.41 |
| Shame | | | | | | | | |
|     Internal shame (IS) | 52.96 | 18.32 | 51.13 | 18.60 | 34.90 | 13.60 | 16.41*** | <0.00 |
|     External shame (ES) | 35.53 | 14.09 | 33.22 | 12.94 | 24.30 | 8.92 | 11.39*** | <0.00 |
| Psychological flexibility (PF) | 37.16 | 8.80 | 38.33 | 9.00 | 36.93 | 8.36 | 0.46 | 0.63 |
| Compassion | | | | | | | | |
|     Self-compassion (SC) | 68.23 | 13.76 | 68.28 | 13.06 | 66.50 | 13.63 | 0.26 | 0.77 |
|     Giving compassion (CTO) | 70.46 | 14.30 | 74.20 | 13.36 | 72.68 | 11.10 | 1.73 | 0.18 |
|     Receiving compassion (CFO) | 62.58 | 17.63 | 64.79 | 18.21 | 62.01 | 18.37 | 0.41 | 0.66 |
| Psychological adjustment | | | | | | | | |
|     Depression (D) | 10.32 | 3.47 | 10.20 | 3.87 | 12.06 | 5.07 | 3.43* | 0.03 |
|     Anxiety (A) | 9.92 | 2.94 | 9.34 | 2.91 | 11.00 | 4.49 | 3.25* | 0.04 |
|     Stress (S) | 13.89 | 4.18 | 14.99 | 5.03 | 16.60 | 5.93 | 5.25** | <0.00 |
| Emotional availability | | | | | | | | |
|     Mutual attunement (MA) | - | - | 40.44 | 4.64 | 40.10 | 5.47 | 0.34 | 0.74 |
|     Child involvement (CI) | - | - | 39.18 | 5.35 | 39.32 | 4.78 | -0.13 | 0.89 |
|     Affect quality (AQ) | - | - | 23.52 | 1.62 | 23.20 | 1.84 | 0.92 | 0.45 |
|     Intrusiveness (INT) | - | - | 18.58 | 3.56 | 17.77 | 3.49 | 1.14 | 0.27 |
|     Hostility (H) | - | - | 8.79 | 3.23 | 10.60 | 4.69 | -2.08* | 0.04 |

*Note. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$.*

One-way ANOVA results showed significant decreases for shame (internal, external) and psychological adjustment (more depression, anxiety, and stress) across the time points. Post-hoc analyses (Bonferroni adjusted *p*-value of 0.01) showed prenatal shame (internal and external) was significantly reduced at 6-months postpartum (internal shame, $p \leq 0.001$; external shame, $p \leq 0.001$). Although psychological symptoms increased from the prenatal to 6-months postpartum mark, only the increase in stress was significant (depression, $p = 0.04$; anxiety, $p = 0.20$; stress, $p \leq 0.001$). Mothers' self-reported hostility significantly increased from 3- to 6-months postpartum ($p = 0.04$).

Lower prenatal attachment insecurity (avoidance and anxiety), less internal shame, less internal shame, and less depression were associated with more self-reported child involvement at 3-months postpartum (Table 3). These relationships were retained at 6-months postpartum (Table 4). Lower attachment avoidance was related to better self-reported mutual attunement, better affect quality, and less hostility at 6-months postpartum.

**Table 3** Correlations between variables at T1 (pregnancy) and T2 (3-months postpartum), n = 63.

| Prenatal | Postpartum (3 months), n = 63 | | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | AVOID | ANX | IS | ES | PF | SC | CTO | CFO | D | A | S | MA | CI | AQ | INT | H |
| AVOID | 0.78*** | 0.16 | 0.40*** | 0.33** | -0.23 | -0.47*** | -0.40*** | -0.40*** | 0.34** | 0.13 | 0.08 | -0.30* | -0.45*** | -0.32* | -0.17 | 0.40*** |
| ANX | 0.30 | 0.71*** | 0.46*** | 0.41*** | -0.50*** | -0.22 | -0.03 | -0.22 | 0.30* | 0.27* | 0.24 | -0.24 | -0.25* | -0.25* | -0.06 | 0.19 |
| IS | 0.46*** | 0.45*** | 0.63*** | 0.83*** | -0.73*** | -0.38*** | -0.30*** | -0.47*** | 0.62*** | 0.43*** | 0.45*** | -0.48*** | -0.35** | -0.28* | -0.18 | 0.43*** |
| ES | 0.40** | 0.42*** | 0.62*** | 0.52*** | -0.38** | -0.22 | 0.01 | -0.30* | 0.42*** | 0.25* | 0.24 | -0.47*** | -0.08 | -0.28* | -0.11 | 0.31* |
| PF | -0.38** | -0.31* | -0.41*** | -0.40*** | 0.42*** | 0.27* | 0.10 | 0.23 | -0.32** | -0.15 | -0.21 | -0.27* | 0.26* | 0.21 | 0.07 | -0.16 |
| SC | -0.21 | -0.14 | -0.25* | -0.22 | 0.18 | 0.50*** | 0.34** | 0.22 | -0.19 | -0.15 | -0.24 | 0.21 | 0.46*** | 0.40*** | -0.05 | -0.30* |
| CTO | -0.20 | 0.08 | -0.15 | -0.19 | 0.09 | 0.44*** | 0.50*** | 0.07 | -0.10 | -0.02 | -0.08 | 0.24 | 0.27* | 0.40*** | -0.03 | -0.28* |
| CFO | -0.38** | -0.08 | -0.29* | -0.20 | 0.02 | 0.30* | 0.22 | 0.43*** | -0.22 | 0.15 | -0.17 | 0.30* | 0.29* | 0.30* | 0.06 | -0.26* |
| D | 0.31* | 0.12 | 0.26* | 0.24 | -0.21 | -0.37** | -0.22 | -0.24 | 0.31* | 0.02 | 0.13 | -0.31* | -0.47*** | -0.40*** | -0.19 | 0.16 |
| A | 0.21 | 0.10 | 0.08 | 0.24 | -0.20 | -0.30* | -0.27* | -0.11 | 0.16 | 0.05 | 0.03 | -0.28* | -0.26* | -0.14 | -0.03 | 0.36** |
| S | 0.24 | 0.22 | 0.21 | 0.14 | -0.28* | -0.06 | 0.02 | -0.11 | 0.23 | 0.04 | 0.21 | -0.13 | -0.03 | -0.10 | 0.07 | 0.05 |

*Note. * p ≤ 0.05, ** p ≤ 0.01, *** p ≤ 0.001.*

**Table 4** Correlations between variables at T1 (pregnancy) and T3 (6-months postpartum), n = 40.

| Prenatal | Postpartum (6 months), n = 40 | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | AVOID | ANX | IS | ES | PF | SC | CTO | CFO | D | A | S | MA | CI | AQ | INT | H |
| AVOID | 0.88 *** | 0.19 | 0.52 *** | 0.53 *** | -0.42 ** | -0.45 ** | -0.33 * | -0.46 ** | 0.50 *** | 0.16 | 0.37 ** | -0.22 | -0.46 ** | -0.18 | -0.01 | 0.30 |
| ANX | 0.38 * | 0.66 *** | 0.51 *** | 0.48 ** | -0.50 *** | -0.36 * | -0.25 | -0.37 * | 0.38 * | 0.35 * | 0.54 *** | -0.20 | -0.36 * | -0.12 | 0.02 | 0.14 |
| IS | 0.67 *** | 0.60 *** | 0.74 *** | 0.77 *** | -0.70 *** | -0.57 *** | -0.27 | -0.33 * | 0.61 *** | 0.57 *** | 0.55 *** | -0.48 *** | -0.54 *** | -0.34 * | 0.09 | 0.43 ** |
| ES | 0.57 *** | 0.66 *** | 0.71 *** | 0.77 *** | -0.58 *** | -0.51 *** | 0.29 | -0.33 * | 0.68 *** | 0.65 *** | 0.58 *** | -0.49 *** | -0.42 *** | -0.34 * | 0.17 | 0.40 * |
| PF | -0.55 *** | -0.42 ** | -0.58 *** | -0.56 *** | 0.63 *** | 0.51 *** | 0.19 | 0.35 * | -0.36 * | 0.33 * | -0.35 * | 0.23 | 0.46 ** | 0.21 | -0.11 | -0.08 |
| SC | -0.42 *** | -0.09 | -0.44 ** | -0.31 | 0.51 *** | 0.69 *** | 0.28 | 0.49 *** | -0.19 | -0.13 | -0.28 | 0.21 | 0.43 ** | 0.33 * | 0.10 | -0.27 |
| CTO | -0.29 | 0.05 | -0.06 | -0.18 | 0.15 | 0.44 ** | 0.40 ** | 0.25 | -0.18 | -0.16 | -0.09 | 0.28 | 0.35 * | 0.41 ** | -0.02 | -0.40 ** |
| CFO | -0.54 *** | -0.15 | -0.35 * | -0.43 ** | 0.39 * | 0.58 *** | 0.44 ** | 0.66 *** | -0.30 | -0.27 | -0.31 * | 0.20 | -0.52 *** | 0.27 | 0.17 | -0.34 * |
| D | 0.46 ** | 0.20 | 0.38 * | 0.25 | -0.43 ** | -0.48 ** | -0.09 | -0.40 * | 0.12 | 0.09 | 0.13 | 0.04 | -0.61 *** | -0.11 | -0.11 | -0.06 |
| A | 0.30 | 0.26 | 0.31 | 0.27 | -0.33 * | -0.44 ** | -0.25 | -0.25 | 0.21 | 0.19 | 0.25 | -0.17 | -0.33 * | 0.03 | 0.12 | 0.02 |
| S | 0.36 * | 0.27 | 0.31 * | 0.16 | -0.32 * | -0.29 | 0.02 | -0.11 | 0.19 | -0.03 | 0.31 | 0.02 | -0.30 | 0.07 | 0.07 | -0.17 |

*Note. * p ≤ 0.05, ** p ≤ 0.01, *** p ≤ 0.001.*

At 3-months postpartum, five 5-step hierarchical regression models were conducted for EA-SR (Table 5). Maternal attachment (Step 2) was significantly associated with self-reported mutual attunement, child involvement, affect quality and hostility. Introducing shame (internal, external) at Step 3 explained a significant amount of additional variance in self-reported mutual attunement, child involvement, and hostility. Adding psychological flexibility and compassion (self, giving, receiving) at Step 4 explained significant further variance in self-reported affect quality and hostility. The final model (with prenatal psychological adjustment at Step 5) significantly explained 74% in self-reported child involvement, 41% in self-reported maternal hostility, 41% in self-reported affect quality, and 33% in self-reported mutual attunement. Although the final model explained 16% of the variance in self-reported intrusiveness, it was not significant. More prenatal attachment avoidance was associated with less self-reported child involvement ($p = 0.04$) at 3-months postpartum. More prenatal attachment anxiety with less self-reported affect quality ($p = 0.04$) at 3-months. Higher prenatal internal shame was related to less self-reported child involvement ($p = 0.04$), and more self-reported hostility ($p = 0.03$). More capacity to give compassion was associated with better self-reported affect quality ($p = 0.01$). More depression related to less self-reported child involvement ($p = 0.01$) and worse self-reported affect quality ($p = 0.01$).

**Table 5** Hierarchical multiple regression results for postpartum emotional availability at 3 months (Time 2) from prenatal variables (Time 1), n = 63.

| | $B$ [LL, UL] | $β$ | $P$ | $R^2$ |
|---|---|---|---|---|
| **Mutual attunement** | | | | |
| Step 1 | | | | |
| Mean maternal age | 0.09 [-0.23, 0.41] | 0.07 | 0.59 | |
| $R = 0.07$, $F (1, 62) = 0.30$ | | | | 0.01 |
| Step 2 | | | | |
| Mean maternal age | 0.03 [-0.28, 0.34] | 0.03 | 0.83 | |
| Attachment avoidance | -0.06 [-0.12, 0.00] | -0.25 | 0.06 | |
| Attachment anxiety | -0.04 [-0.11, 0.03] | -0.16 | 0.24 | |
| $R = 0.34$, $F (3, 60) = 2.57$ | | | | 0.11 |
| $\Delta R^2 = 0.11$, $F$ change = 3.69* | | | | |
| Step 3 | | | | |
| Mean maternal age | 0.08 [-0.22, 0.37] | 0.06 | 0.61 | |
| Attachment avoidance | -0.00 [-0.08, 0.07] | -0.01 | 0.98 | |
| Attachment anxiety | 0.03 [-0.06, 0.11] | 0.11 | 0.51 | |
| Internal shame | -0.07 [-0.24, 0.09] | -0.24 | 0.38 | |
| External shame | -0.11 [-0.27, 0.04] | -0.32 | 0.15 | |
| $R = 0.49$, $F (5, 58) = 3.61$** | | | | 0.24** |
| $\Delta R^2 = 0.12$, $F$ change = 4.69* | | | | |
| Step 4 | | | | |
| Mean maternal age | 0.09 [-0.22, 0.39] | 0.07 | 0.57 | |
| Attachment avoidance | 0.01 [-0.07, 0.10] | 0.06 | 0.74 | |
| Attachment anxiety | 0.01 [-0.08, 0.11] | 0.05 | 0.89 | |
| Internal shame | -0.06 [-0.23, 0.11] | -0.19 | 0.50 | |
| External shame | -0.13 [-0.29, 0.04] | -0.36 | 0.12 | |

| | | | | | |
|---|---|---|---|---|---|
| | Psychological flexibility | -0.04 [-0.23, 0.16] | -0.07 | 0.70 | |
| | Self-compassion | 0.01 [-0.11, 0.12] | 0.02 | 0.92 | |
| | Giving compassion | 0.06 [-0.05, 0.17] | 0.18 | 0.26 | |
| | Receiving compassion | 0.02 [-0.07, 0.12] | 0.07 | 0.65 | |
| | | $R = 0.53$, $F (9, 54) = 2.31$* | | | 0.28* |
| | | $\Delta R^2 = 0.04$, $F$ change = 0.77 | | | |
| Step 5 | | | | | |
| | Mean maternal age | 0.06 [-0.25, 0.37] | 0.05 | 0.70 | |
| | Attachment avoidance | 0.03 [-0.06, 0.37] | 0.12 | 0.49 | |
| | Attachment anxiety | 0.02 [-0.08, 0.11] | 0.06 | 0.74 | |
| | Internal shame | -0.05 [-0.22, 0.12] | -0.17 | 0.56 | |
| | External shame | -0.16 [-0.32, 0.01] | -0.44 | 0.06 | |
| | Psychological flexibility | -0.05 [-0.25, 0.16] | -0.09 | 0.63 | |
| | Self-compassion | 0.00 [-0.12, 0.12] | 0.00 | 0.98 | |
| | Giving compassion | 0.05 [-0.07, 0.16] | 0.13 | 0.41 | |
| | Receiving compassion | 0.01 [-0.10, 0.12] | 0.03 | 0.85 | |
| | Depression | -0.20 [-0.73, 0.32] | -0.14 | 0.44 | |
| | Anxiety | -0.46 [-1.06, 0.14] | -0.23 | 0.13 | |
| | Stress | 0.23 [-0.17, 0.62] | 0.19 | 0.26 | |
| | | $R = 0.58$, $F (12,51) = 2.10$* | | | 0.33* |
| | | $\Delta R^2 = 0.05$, $F$ change = 1.34 | | | |
| **Child involvement** | | | | | |
| Step 1 | | | | | |
| | Mean maternal age | -0.06 [-0.41, 0.29] | -0.04 | 0.74 | |
| | | $R = 0.04$, $F (1, 62) = 0.11$ | | | 0.01 |
| Step 2 | | | | | |
| | Mean maternal age | -0.13 [-0.45, 0.19] | -0.09 | 0.41 | |
| | Attachment avoidance | -0.11 [-0.17, -0.05] | -0.42 | ≤0.001*** | |
| | Attachment anxiety | -0.03 [-0.10, 0.04] | -0.12 | 0.35 | |
| | | $R = 0.47$, $F (3, 60) = 5.78$** | | | 0.22** |
| | | $\Delta R^2 = 0.22$, $F$ change = 8.60*** | | | |
| Step 3 | | | | | |
| | Mean maternal age | -0.12 [-0.42, 0.17] | -0.09 | 0.41 | |
| | Attachment avoidance | -0.10 [-0.18, -0.03] | -0.39 | 0.01** | |
| | Attachment anxiety | -0.03 [-0.11, 0.06] | -0.09 | 0.53 | |
| | Internal shame | -0.21 [-0.38, -0.05] | -0.65 | 0.01** | |
| | External shame | 0.29 [0.13, 0.44] | 0.72 | ≤0.001*** | |
| | | $R = 0.61$, $F (5, 58) = 6.77$*** | | | 0.37*** |
| | | $\Delta R^2 = 0.15$, $F$ change = 6.64** | | | |
| Step 4 | | | | | |
| | Mean maternal age | -0.14 [-0.43, 0.16] | -0.10 | 0.36 | |
| | Attachment avoidance | -0.10 [-0.17, -0.01] | -0.35 | 0.02* | |
| | Attachment anxiety | -0.02 [-0.11, 0.08] | -0.06 | 0.70 | |
| | Internal shame | -0.18 [-0.35, -0.02] | -0.56 | 0.03* | |
| | External shame | 0.25 [0.09, 0.40] | 0.62 | 0.01** | |
| | Psychological flexibility | -0.03 [-0.22, 0.16] | -0.33 | 0.75 | |
| | Self-compassion | 0.13 [0.02, 0.24] | 0.31 | 0.02* | |
| | Giving compassion | -0.01 [-0.11, 0.10] | -0.02 | 0.88 | |

| | | | | |
|---|---|---|---|---|
| Receiving compassion | -0.01 [-0.10, 0.09] | -0.02 | 0.88 | |
| | *R* = 0.67, *F* (9, 54) = 4.76*** | | | 0.44*** |
| | Δ*R²* = 0.07, *F* change = 1.78 | | | |
| **Step 5** | | | | |
| Mean maternal age | -0.19 [-0.47, 0.09] | -0.14 | 0.17 | |
| Attachment avoidance | 0.03 [-0.06, 0.37] | -0.32 | 0.04* | |
| Attachment anxiety | 0.02 [-0.08, 0.11] | -0.11 | 0.48 | |
| Internal shame | -0.05 [-0.22, 0.12] | -0.50 | 0.04* | |
| External shame | -0.16 [-0.32, 0.01] | 0.52 | 0.01** | |
| Psychological flexibility | -0.05 [-0.25, 0.16] | -0.04 | 0.79 | |
| Self-compassion | 0.00 [-0.12, 0.12] | 0.24 | 0.06 | |
| Giving compassion | 0.05 [-0.07, 0.16] | 0.04 | 0.76 | |
| Receiving compassion | 0.01 [-0.10, 0.12] | -0.22 | 0.13 | |
| Depression | -0.20 [-0.73, 0.32] | -0.42 | 0.01** | |
| Anxiety | -0.46 [-1.06, 0.14] | -0.02 | 0.86 | |
| Stress | 0.23 [-0.17, 0.62] | 0.39 | 0.01** | |
| | *R* = 0.74, *F* (12,51) = 5.22*** | | | 0.74*** |
| | Δ*R²* = 0.11, *F* change = 4.13 | | | |

**Affect quality**

| | | | | |
|---|---|---|---|---|
| **Step 1** | | | | |
| Mean maternal age | -0.01 [-0.11, 0.10] | -0.02 | 0.88 | |
| | *R* = 0.02, *F* (1, 62) = 0.03 | | | 0.01 |
| **Step 2** | | | | |
| Mean maternal age | -0.03 [-0.13, 0.07] | -0.07 | 0.60 | |
| Attachment avoidance | -0.02 [-0.04, -0.01] | -0.27 | 0.04* | |
| Attachment anxiety | -0.01 [-0.04, 0.01] | -0.17 | 0.21 | |
| | *R* = 0.36, *F* (3, 60) = 2.97* | | | 0.13* |
| | Δ*R²* = 0.13, *F* change = 4.44* | | | |
| **Step 3** | | | | |
| Mean maternal age | -0.03 [-13, 0.08] | -0.07 | 0.59 | |
| Attachment avoidance | -0.02 [-0.05, 0.01] | -0.29 | 0.08 | |
| Attachment anxiety | -0.02 [-0.05, 0.01] | -0.18 | 0.28 | |
| Internal shame | 0.02 [-0.04, 0.08] | 0.19 | 0.53 | |
| External shame | -0.02 [-0.08, 0.03] | -0.19 | 0.43 | |
| | *R* = 0.37, *F* (5, 58) = 1.87 | | | 0.14 |
| | Δ*R²* = 0.01, *F* change = 0.33 | | | |
| **Step 4** | | | | |
| Mean maternal age | -0.03 [-0.13, 0.07] | -0.08 | 0.50 | |
| Attachment avoidance | -0.02 [-0.05, 0.01] | -0.25 | 0.15 | |
| Attachment anxiety | -0.03 [-0.06, 0.01] | -0.32 | 0.09 | |
| Internal shame | 0.03 [-0.09, 0.01] | 0.35 | 0.22 | |
| External shame | -0.04 [-0.09, 0.01] | -0.35 | 0.12 | |
| Psychological flexibility | -0.04 [-0.10, 0.03] | -0.20 | 0.25 | |
| Self-compassion | 0.03 [-0.01, 0.06] | 0.21 | 0.16 | |
| Giving compassion | 0.04 [0.00, 0.08] | 0.33 | 0.03* | |
| Receiving compassion | -0.01 [-0.04, 0.02] | -0.08 | 0.60 | |
| | *R* = 0.56, *F* (9, 54) = 2.72* | | | 0.31* |
| | Δ*R²* = 0.17, *F* change = 3.40* | | | |

| | | | | |
|---|---|---|---|---|
| **Step 5** | | | | |
| | Mean maternal age | -0.04 [-0.13, 0.06] | -0.09 | 0.42 |
| | Attachment avoidance | -0.02 [-0.04, 0.01] | -0.20 | 0.23 |
| | Attachment anxiety | -0.03 [-0.06, -0.01] | -0.37 | 0.04* |
| | Internal shame | 0.04 [-0.01, 0.09] | 0.42 | 0.12 |
| | External shame | -0.05 [-0.10, 0.00] | -0.40 | 0.07 |
| | Psychological flexibility | -0.04 [-0.11, 0.02] | -0.23 | 0.19 |
| | Self-compassion | 0.02 [-0.10, 0.05] | 0.13 | 0.36 |
| | Giving compassion | 0.05 [0.02, 0.09] | 0.44 | 0.01** |
| | Receiving compassion | -0.03 [-0.06, 0.01] | -0.24 | 0.14 |
| | Depression | -0.23 [-0.40, -0.07] | -0.47 | 0.01** |
| | Anxiety | 0.10 [-0.09, 0.28] | 0.15 | 0.29 |
| | Stress | 0.08 [-0.05, 0.20] | 0.20 | 0.22 |
| | *R* = 0.64, *F* (12,51) = 2.95** | | | 0.41** |
| | $\Delta R^2$ = 0.10, *F* change = 2.82* | | | |
| **Intrusiveness** | | | | |
| **Step 1** | | | | |
| | Mean maternal age | 0.08 [-0.16, 0.32] | 0.08 | 0.52 |
| | *R* = 0.08, *F* (1, 62) = 0.43 | | | 0.01 |
| **Step 2** | | | | |
| | Mean maternal age | 0.07 [-0.18, 0.31] | 0.07 | 0.60 |
| | Attachment avoidance | -0.03 [-0.08, 0.02] | -0.17 | 0.22 |
| | Attachment anxiety | 0.01 [-0.05, 0.06] | 0.01 | 0.22 |
| | *R* = 0.19, *F* (3, 60) = 0.71 | | | 0.03 |
| | $\Delta R^2$ = 0.03, *F* change = 0.85 | | | |
| **Step 3** | | | | |
| | Mean maternal age | 0.08 [-0.17, 0.33] | 0.08 | 0.52 |
| | Attachment avoidance | -0.01 [-0.07, 0.05] | -0.05 | 0.75 |
| | Attachment anxiety | 0.02 [-0.05, 0.09] | 0.12 | 0.50 |
| | Internal shame | -0.08 [-0.22, 0.08] | -0.35 | 0.26 |
| | External shame | 0.04 [-0.09, 0.17] | 0.15 | 0.54 |
| | *R* = 0.24, *F* (5, 58) = 0.69 | | | 0.06 |
| | $\Delta R^2$ = 0.02, *F* change = 0.67 | | | |
| **Step 4** | | | | |
| | Mean maternal age | 0.08 [-0.19, 0.34] | 0.08 | 0.55 |
| | Attachment avoidance | -0.01 [-0.09, 0.06] | -0.08 | 0.69 |
| | Attachment anxiety | 0.02 [-0.06, 0.11] | 0.11 | 0.61 |
| | Internal shame | -0.09 [-0.24, 0.06] | -0.41 | 0.22 |
| | External shame | 0.05 [-0.09, 0.20] | 0.20 | 0.44 |
| | Psychological flexibility | -0.01 [-0.18, 0.16] | -0.02 | 0.93 |
| | Self-compassion | -0.04 [-0.14, 0.06] | -0.13 | 0.46 |
| | Giving compassion | -0.01 [-0.11, 0.08] | -0.05 | 0.79 |
| | Receiving compassion | 0.01 [-0.07, 0.09] | 0.05 | 0.78 |
| | *R* = 0.27, *F* (9, 54) = 0.48 | | | 0.07 |
| | $\Delta R^2$ = 0.02, *F* change = 0.26 | | | |
| **Step 5** | | | | |
| | Mean maternal age | 0.04 [-0.22, 0.31] | 0.04 | 0.75 |
| | Attachment avoidance | -0.02 [-0.09, 0.06] | -0.08 | 0.69 |

| | | | | |
|---|---|---|---|---|
| Attachment anxiety | 0.01 [-0.07, 0.10] | 0.06 | 0.78 | |
| Internal shame | -0.08 [-0.23, 0.06] | -0.36 | 0.26 | |
| External shame | 0.03 [-0.11, 0.18] | 0.12 | 0.64 | |
| Psychological flexibility | 0.01 [-0.17, 0.18] | 0.02 | 0.93 | |
| Self-compassion | -0.06 [-0.16, 0.04] | -0.19 | 0.27 | |
| Giving compassion | 0.01 [-0.09, 0.11] | 0.02 | 0.89 | |
| Receiving compassion | -0.03 [-0.13, 0.06] | -0.14 | 0.46 | |
| Depression | -0.40 [-0.85, 0.06] | -0.34 | 0.08 | |
| Anxiety | 0.07 [-0.44, 0.58] | 0.05 | 0.78 | |
| Stress | 0.32 [-0.02, 0.66] | 0.35 | 0.07 | |
| | $R = 0.40$, $F (12,51) = 0.78$ | | | 0.16 |
| | $\Delta R^2 = 0.08$, $F$ change = 1.65 | | | |

**Hostility**

**Step 1**

| | | | | |
|---|---|---|---|---|
| Mean maternal age | -0.05 [-0.27, 0.17] | -0.06 | 0.64 | |
| | $R = 0.06$, $F (1, 62) = 0.21$ | | | 0.01 |

**Step 2**

| | | | | |
|---|---|---|---|---|
| Mean maternal age | -0.02 [-0.22, 0.19] | -0.02 | 0.88 | |
| Attachment avoidance | 0.06 [0.02, 0.10] | 0.37 | 0.01** | |
| Attachment anxiety | 0.01 [-0.04, 0.05] | 0.06 | 0.66 | |
| | $R = 0.40$, $F (3, 60) = 3.78*$ | | | 0.16* |
| | $\Delta R^2 = 0.16$, $F$ change = 5.55** | | | |

**Step 3**

| | | | | |
|---|---|---|---|---|
| Mean maternal age | -0.04 [-0.22, 0.17] | -0.05 | 0.67 | |
| Attachment avoidance | 0.02 [-0.03, 0.07] | 0.15 | 0.34 | |
| Attachment anxiety | -0.03 [-0.09, 0.02] | -0.18 | 0.26 | |
| Internal shame | 0.13 [0.02, 0.24] | 0.64 | 0.03* | |
| External shame | -0.05 [-0.16, 0.05] | -0.21 | 0.33 | |
| | $R = 0.49$, $F (5, 58) = 3.63**$ | | | 0.24** |
| | $\Delta R^2 = 0.08$, $F$ change = 3.03 | | | |

**Step 4**

| | | | | |
|---|---|---|---|---|
| Mean maternal age | -0.02 [-0.22, 0.19] | -0.02 | 0.86 | |
| Attachment avoidance | 0.03 [-0.03, 0.06] | 0.16 | 0.35 | |
| Attachment anxiety | -0.01 [-0.08, 0.05] | -0.06 | 0.75 | |
| Internal shame | 0.11 [0.01, 0.23] | 0.57 | 0.05* | |
| External shame | -0.03 [-0.14, 0.08] | -0.11 | 0.62 | |
| Psychological flexibility | 0.09 [-0.04, 0.22] | 0.24 | 0.17 | |
| Self-compassion | -0.03 [-0.11, 0.05] | -0.12 | 0.43 | |
| Giving compassion | -0.04 -0.11, 0.04] | -0.15 | 0.32 | |
| Receiving compassion | 0.01 [-0.06, 0.07] | 0.03 | 0.83 | |
| | $R = 0.54$, $F (9, 54) = 2.52*$ | | | 0.30* |
| | $\Delta R^2 = 0.06$, $F$ change = 1.10 | | | |

**Step 5**

| | | | | |
|---|---|---|---|---|
| Mean maternal age | 0.01 [-0.19, 0.21] | 0.01 | 0.92 | |
| Attachment avoidance | 0.02 [-0.03, 0.08] | 0.15 | 0.39 | |
| Attachment anxiety | -0.02 [-0.08, 0.04] | -0.10 | 0.56 | |
| Internal shame | 0.12 [0.01, 0.23] | 0.61 | 0.03* | |
| External shame | -0.01 [-0.12, 0.09] | -0.04 | 0.85 | |

| | | | | |
|---|---|---|---|---|
| Psychological flexibility | 0.07 [-0.06, 0.20] | 0.19 | 0.26 | |
| Self-compassion | -0.04 [-0.12, 0.03] | -0.16 | 0.26 | |
| Giving compassion | -0.01 [-0.08, 0.07] | -0.03 | 0.87 | |
| Receiving compassion | -0.01 [-0.07, 0.07] | -0.01 | 0.96 | |
| Depression | -0.24 [-0.57, 0.09] | -0.24 | 0.16 | |
| Anxiety | 0.52 [0.14, 0.90] | 0.38 | 0.01** | |
| Stress | -0.15 [-0.40, 0.10] | -0.19 | 0.24 | |
| | $R = 0.64$, $F(12,51) = 2.91$** | | | 0.41** |
| | $\Delta R^2 = 0.11$, $F$ change = 3.17* | | | |

*Note.* * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$, ª $p < 0.06$ (approaching significance).

At 6-months postpartum, five 5-step hierarchical regression models were conducted for EA-SR (Table 6). The final model (with prenatal psychological adjustment at Step 5) significantly explained 62% in self-reported hostility, 53% in self-reported child involvement, and 52% in self-reported mutual attunement. The model explained 37% in self-reported affect quality and 18% in self-reported intrusiveness but it was not significant. More prenatal giving compassion was associated with better self-reported affect quality ($p = 0.05$) and less self-reported hostility ($p = 0.02$) at 6-months postpartum.

**Table 6** Hierarchical multiple regression results for postpartum emotional availability at 6 months (Time 3) from prenatal variables (Time 1), n = 40.

| | $B$ [LL, UL] | $\beta$ | $p$ | $R^2$ |
|---|---|---|---|---|
| Mutual attunement | | | | |
| Step 1 | | | | |
| Mean maternal age | 0.21 [-0.18, 0.60] | 0.18 | 0.28 | |
| | $R = 0.18$, $F(1, 38) = 1.23$ | | | 0.03 |
| Step 2 | | | | |
| Mean maternal age | 0.18 [-0.22, 0.57] | 0.15 | 0.37 | |
| Attachment avoidance | -0.04 [-0.13, 0.06] | -0.14 | 0.43 | |
| Attachment anxiety | -0.04 [-0.13, 0.06] | -0.14 | 0.45 | |
| | $R = 0.29$, $F(3, 36) = 1.01$ | | | 0.08 |
| | $\Delta R^2 = 0.05$, $F$ change = 1.04 | | | |
| Step 3 | | | | |
| Mean maternal age | 0.13 [-0.23, 0.49] | 0.11 | 0.46 | |
| Attachment avoidance | 0.04 [-0.06, 0.15] | 0.16 | 0.40 | |
| Attachment anxiety | 0.03 [-0.06, 0.13] | 0.13 | 0.49 | |
| Internal shame | -0.11 [-0.33, 0.12] | -0.36 | 0.34 | |
| External shame | -0.12 [-0.38, 0.14] | -0.32 | 0.34 | |
| | $R = 0.54$, $F(5, 34) = 2.74$* | | | 0.29* |
| | $\Delta R^2 = 0.20$, $F$ change = 4.86* | | | |
| Step 4 | | | | |
| Mean maternal age | 0.15 [-0.22, 0.52] | 0.13 | 0.41 | |
| Attachment avoidance | 0.04 [-0.08, 0.16] | 0.14 | 0.53 | |
| Attachment anxiety | -0.03 [-0.15, 0.10] | -0.10 | 0.67 | |
| Internal shame | -0.10 [-0.34, 0.14] | -0.34 | 0.38 | |

|  |  |  |  |  |  |
|---|---|---|---|---|---|
| | External shame | -0.13 [-0.40, 0.14] | -0.34 | 0.33 | |
| | Psychological flexibility | -0.11 [-0.41, 0.19] | -0.20 | 0.44 | |
| | Self-compassion | -0.02 [-0.17, 0.14] | -0.22 | 0.83 | |
| | Giving compassion | 0.11 [-0.05, 0.26] | 0.28 | 0.17 | |
| | Receiving compassion | -0.04 [-0.19, 0.12] | -0.11 | 0.64 | |
| | | $R = 0.59$, $F (9, 30) = 1.75$ | | | 0.34 |
| | | $\Delta R^2 = 0.06$, $F$ change $= 0.64$ | | | |
| Step 5 | | | | | |
| | Mean maternal age | 0.01 [-0.36, 0.38] | 0.01 | 0.96 | |
| | Attachment avoidance | -0.03 [-0.15, 0.10] | -0.11 | 0.63 | |
| | Attachment anxiety | -0.05 [-0.17, 0.07] | -0.20 | 0.40 | |
| | Internal shame | -0.22 [-0.45, 0.01] | -0.73 | 0.06 | |
| | External shame | -0.01 [-0.27, 0.24] | -0.03 | 0.94 | |
| | Psychological flexibility | 0.02 [-0.27, 0.30] | 0.03 | 0.90 | |
| | Self-compassion | 0.05 [-0.10, 0.19] | 0.13 | 0.53 | |
| | Giving compassion | 0.10 [-0.05, 0.24] | 0.25 | 0.18 | |
| | Receiving compassion | -0.13 [-0.31, 0.06] | -0.37 | 0.18 | |
| | Depression | 0.74 [-0.06, 1.54] | 0.44 | 0.07 | |
| | Anxiety | -0.41 [-0.20, 1.25] | -0.22 | 0.30 | |
| | Stress | 0.53 [-0.20, 1.25] | 0.47 | 0.15 | |
| | | $R = 0.72$, $F (12, 27) = 2.48*$ | | | 0.52* |
| | | $\Delta R^2 = 0.18$, $F$ change $= 3.41*$ | | | |
| **Child involvement** | | | | | |
| Step 1 | | | | | |
| | Mean maternal age | 0.18 [-0.18, 0.54] | 0.16 | 0.32 | |
| | | $R = 0.16$, $F (1, 38) = 1.03$ | | | 0.03 |
| Step 2 | | | | | |
| | Mean maternal age | 0.11 [-0.23, 0.44] | 0.10 | 0.52 | |
| | Attachment avoidance | -0.09 [-0.17, -0.01] | -0.36 | 0.03* | |
| | Attachment anxiety | -0.05 [-0.13, 0.03] | -0.20 | 0.21 | |
| | | $R = 0.50$, $F (3, 36) = 4.01*$ | | | 0.25* |
| | | $\Delta R^2 = 0.22$, $F$ change $= 5.38**$ | | | |
| Step 3 | | | | | |
| | Mean maternal age | 0.07 [-0.26, 0.40] | 0.06 | 0.67 | |
| | Attachment avoidance | -0.04 [-0.13, 0.05] | -0.17 | 0.38 | |
| | Attachment anxiety | -0.02 [-0.10, 0.07] | -0.08 | 0.67 | |
| | Internal shame | -0.18 [-0.39, 0.02] | -0.08 | 0.07 | |
| | External shame | 0.11 [-0.13, 0.35] | 0.31 | 0.35 | |
| | | $R = 0.58$, $F (5, 34) = 3.41*$ | | | 0.33 |
| | | $\Delta R^2 = 0.08$, $F$ change $= 2.13$ | | | |
| Step 4 | | | | | |
| | Mean maternal age | 0.10 [-0.22, 0.41] | 0.09 | 0.54 | |
| | Attachment avoidance | 0.00 [-0.10, 0.11] | 0.02 | 0.93 | |
| | Attachment anxiety | -0.02 [-0.13, 0.08] | -0.10 | 0.66 | |
| | Internal shame | -0.12 [-0.32, 0.09] | -0.41 | 0.26 | |
| | External shame | 0.11 [-0.12, 0.33] | 0.29 | 0.36 | |
| | Psychological flexibility | 0.12 [-0.14, 0.38] | 0.22 | 0.35 | |
| | Self-compassion | -0.01 [-0.14, 0.13] | 0.22 | 0.35 | |

| | | | | | |
|---|---|---|---|---|---|
| | Giving compassion | 0.08 [-0.05, 0.21] | 0.23 | 0.23 | |
| | Receiving compassion | 0.08 [-0.05, 0.22] | 0.27 | 0.22 | |
| | | *R* = 0.67, *F* (9, 30) = 2.67* | | | 0.45* |
| | | Δ*R²* = 0.11, *F* change = 1.52 | | | |
| Step 5 | | | | | |
| | Mean maternal age | 0.09 [-0.25, 0.44] | 0.08 | 0.58 | |
| | Attachment avoidance | 0.02 [-0.09, 0.14] | 0.09 | 0.69 | |
| | Attachment anxiety | -0.02 [-0.13, 0.09] | -0.09 | 0.70 | |
| | Internal shame | -0.07 [-0.28, 0.15] | -0.24 | 0.53 | |
| | External shame | 0.06 [-0.18, 0.29] | 0.16 | 0.62 | |
| | Psychological flexibility | 0.05 [-0.22, 0.31] | 0.09 | 0.72 | |
| | Self-compassion | -0.05 [-0.18, 0.09] | -0.15 | 0.48 | |
| | Giving compassion | 0.09 [-0.04, 0.22] | 0.26 | 0.17 | |
| | Receiving compassion | 0.08 [-0.10, 0.26] | 0.26 | 0.36 | |
| | Depression | -0.72 [-1.46, 0.03] | -0.46 | 0.06 | |
| | Anxiety | -0.07 [-0.80, 0.66] | -0.04 | 0.84 | |
| | Stress | 0.09 [-0.57, 0.77] | 0.09 | 0.78 | |
| | | *R* = 0.73, *F* (12, 27) = 2.51* | | | 53* |
| | | Δ*R²* = 0.08, *F* change = 1.52 | | | |
| **Affect quality** | | | | | |
| Step 1 | | | | | |
| | Mean maternal age | 0.05 [-0.09, 0.19] | 0.11 | 0.49 | |
| | | *R* = 0.11, *F* (1, 38) = 0.50 | | | 0.01 |
| Step 2 | | | | | |
| | Mean maternal age | 0.04 [-0.11, 0.18] | 0.09 | 0.60 | |
| | Attachment avoidance | -0.01 [-0.05, 0.02] | -0.15 | 0.43 | |
| | Attachment anxiety | -0.01 [-0.04, 0.03] | -0.06 | 0.76 | |
| | | *R* = 0.21, *F* (3, 36) = 0.54 | | | 0.04 |
| | | Δ*R²* = 0.03, *F* change = 0.57 | | | |
| Step 3 | | | | | |
| | Mean maternal age | 0.03 [-0.11, 0.17] | 0.06 | 0.71 | |
| | Attachment avoidance | 0.01 [-0.03, 0.05] | 0.07 | 0.74 | |
| | Attachment anxiety | 0.01 [-0.03, 0.05] | 0.13 | 0.52 | |
| | Internal shame | -0.03 [-0.12, 0.06] | -0.29 | 0.48 | |
| | External shame | -0.03 [-0.13, 0.08] | -0.19 | 0.61 | |
| | | *R* = 0.38, *F* (5, 34) = 1.12 | | | 0.14 |
| | | Δ*R²* = 0.10, *F* change = 1.94 | | | |
| Step 4 | | | | | |
| | Mean maternal age | 0.04 [-0.10, 0.18] | 0.09 | 0.57 | |
| | Attachment avoidance | 0.01 [-0.03, 0.06] | 0.15 | 0.52 | |
| | Attachment anxiety | -0.01 [-0.05, 0.04] | -0.06 | 0.82 | |
| | Internal shame | -0.01 [-0.10, 0.08] | -0.11 | 0.79 | |
| | External shame | -0.03 [-0.13, 0.07] | -0.20 | 0.58 | |
| | Psychological flexibility | -0.01 [-0.11, 0.11] | -0.01 | 0.97 | |
| | Self-compassion | 0.01 [-0.05, 0.06] | 0.05 | 0.82 | |
| | Giving compassion | 0.05 [-0.01, 0.11] | 0.37 | 0.09 | |
| | Receiving compassion | 0.01 [-0.06, 0.06] | 0.01 | 0.98 | |
| | | *R* = 0.52, *F* (9, 30) = 1.21 | | | 0.27 |

|  |  |  |  |  |  |
|---|---|---|---|---|---|
|  |  | $\Delta R^2 = 0.13$, $F$ change = 1.28 |  |  |  |
| Step 5 |  |  |  |  |  |
|  | Mean maternal age | 0.00 [-0.15, 0.15] | 0.01 | 0.96 |  |
|  | Attachment avoidance | -0.01 [-0.06, 0.04] | -0.11 | 0.67 |  |
|  | Attachment anxiety | -0.02 [-0.07, 0.03] | -0.24 | 0.37 |  |
|  | Internal shame | -0.02 [-0.12, 0.07] | -0.19 | 0.66 |  |
|  | External shame | -0.02 [-0.12, 0.09] | -0.13 | 0.74 |  |
|  | Psychological flexibility | 0.04 [-0.08, 0.15] | 0.17 | 0.55 |  |
|  | Self-compassion | 0.02 [-0.04, 0.08] | 0.19 | 0.43 |  |
|  | Giving compassion | 0.06 [0.01, 0.12] | 0.44 | 0.05* |  |
|  | Receiving compassion | -0.04 [-0.12, 0.04] | -0.35 | 0.28 |  |
|  | Depression | 0.00 [-0.32, 0.33] | 0.00 | 0.99 |  |
|  | Anxiety | 0.14 [-0.19, 0.45] | 0.20 | 0.39 |  |
|  | Stress | 0.17 [-0.13, 0.47] | 0.42 | 0.26 |  |
|  |  | $R = 0.61$, $F_{(12, 27)} = 1.35$ |  |  | 0.37 |
|  |  | $\Delta R^2 = 0.11$, $F$ change = 1.56 |  |  |  |
| **Intrusiveness** |  |  |  |  |  |
| Step 1 |  |  |  |  |  |
|  | Mean maternal age | 0.08 [-0.18, 0.33] | 0.10 | 0.53 |  |
|  |  | $R = 0.10$, $F_{(1, 38)} = 0.40$ |  |  | 0.01 |
| Step 2 |  |  |  |  |  |
|  | Mean maternal age | 0.08 [-0.16, 0.34] | 0.10 | 0.55 |  |
|  | Attachment avoidance | -0.01 [-0.06, 0.06] | -0.01 | 0.98 |  |
|  | Attachment anxiety | 0.01 [-0.06, 0.07] | 0.03 | 0.89 |  |
|  |  | $R = 0.11$, $F_{(3, 36)} = 0.13$ |  |  | 0.01 |
|  |  | $\Delta R^2 = 0.01$, $F$ change = 0.01 |  |  |  |
| Step 3 |  |  |  |  |  |
|  | Mean maternal age | 0.08 [-0.18, 0.35] | 0.13 | 0.54 |  |
|  | Attachment avoidance | -0.02 [-0.09, 0.06] | -0.09 | 0.68 |  |
|  | Attachment anxiety | -0.01 [-0.08, 0.06] | -0.08 | 0.69 |  |
|  | Internal shame | -0.04 [-0.21, 0.12] | -0.22 | 0.61 |  |
|  | External shame | 0.12 [-0.07, 0.31] | 0.48 | 0.22 |  |
|  |  | $R = 0.27$, $F_{(5, 34)} = 0.53$ |  |  | 0.07 |
|  |  | $\Delta R^2 = 0.06$, $F$ change = 1.12 |  |  |  |
| Step 4 |  |  |  |  |  |
|  | Mean maternal age | 0.08 [-0.19, 0.36] | 0.11 | 0.55 |  |
|  | Attachment avoidance | -0.01 [-0.09, 0.36] | -0.03 | 0.89 |  |
|  | Attachment anxiety | -0.01 [-0.10, 0.09] | -0.04 | 0.88 |  |
|  | Internal shame | -0.04 [-0.21, 0.14] | -0.18 | 0.69 |  |
|  | External shame | 0.11 [-0.09, 0.31] | 0.44 | 0.27 |  |
|  | Psychological flexibility | -0.04 [-0.26, 0.18] | -0.11 | 0.71 |  |
|  | Self-compassion | 0.03 [-0.09, 0.14] | 0.12 | 0.64 |  |
|  | Giving compassion | -0.03 [-0.15, 0.08] | -0.13 | 0.57 |  |
|  | Receiving compassion | 0.05 [-0.07, 0.17] | 0.23 | 0.38 |  |
|  |  | $R = 0.37$, $F_{(9, 30)} = 0.52$ |  |  | 0.14 |
|  |  | $\Delta R^2 = 0.06$, $F$ change = 0.54 |  |  |  |
| Step 5 |  |  |  |  |  |
|  | Mean maternal age | 0.12 [-0.19, 0.44] | 0.16 | 0.42 |  |

| | | | | | |
|---|---|---|---|---|---|
| | Attachment avoidance | 0.01 [-0.97, 0.12] | 0.06 | 0.85 | |
| | Attachment anxiety | -0.00 [-0.11, 0.10] | -0.02 | 0.94 | |
| | Internal shame | 0.01 [-0.19, 0.20] | 0.03 | 0.96 | |
| | External shame | 0.07 [-0.15, 0.29] | 0.28 | 0.52 | |
| | Psychological flexibility | -0.08 [-0.32, 0.17] | -0.20 | 0.53 | |
| | Self-compassion | 0.01 [-0.11, 0.14] | 0.05 | 0.86 | |
| | Giving compassion | -0.03 [-0.15, 0.10] | -0.10 | 0.67 | |
| | Receiving compassion | 0.07 [-0.90, 0.23] | 0.32 | 0.38 | |
| | Depression | -0.25 [-0.93, 0.43] | -0.23 | 0.45 | |
| | Anxiety | 0.22 [-0.45, 0.88] | 0.18 | 0.51 | |
| | Stress | -0.15 [-0.78, 0.47] | -0.21 | 0.63 | |
| | | $R = 0.43$, $F (12, 27) = 0.50$ | | | 0.18 |
| | | $\Delta R^2 = 0.05$, $F$ change $= 0.51$ | | | |
| **Hostility** | | | | | |
| Step 1 | | | | | |
| | Mean maternal age | -0.31 [-0.63, 0.02] | -0.30 | 0.06 | |
| | | $R = 0.30$, $F (1, 38) = 3.72$ | | | 0.09 |
| Step 2 | | | | | |
| | Mean maternal age | -0.27 [-0.59, 0.06] | -0.26 | 0.10 | |
| | Attachment avoidance | -0.27 [-0.02, 0.13] | 0.24 | 0.16 | |
| | Attachment anxiety | 0.01 [-0.07, 0.08] | 0.03 | 0.87 | |
| | | $R = 0.39$, $F (3, 36) = 2.17$ | | | 0.15 |
| | | $\Delta R^2 = 0.06$, $F$ change $= 1.36$ | | | |
| Step 3 | | | | | |
| | Mean maternal age | -0.24 [-0.55, 0.08] | -0.23 | 0.14 | |
| | Attachment avoidance | 0.01 [-0.08, 0.10] | 0.02 | 0.92 | |
| | Attachment anxiety | -0.03 [-0.12, 0.05] | -0.16 | 0.41 | |
| | Internal shame | 0.09 [-0.10, 0.29] | 0.36 | 0.34 | |
| | External shame | 0.04 [-0.19, 0.27] | 0.12 | 0.73 | |
| | | $R = 0.50$, $F (5, 34) = 2.29$ | | | 0.25 |
| | | $\Delta R^2 = 0.10$, $F$ change $= 2.24$ | | | |
| Step 4 | | | | | |
| | Mean maternal age | -0.26 [-0.55, 0.03] | -0.25 | 0.08 | |
| | Attachment avoidance | 0.01 [-0.08, 0.10] | 0.05 | 0.83 | |
| | Attachment anxiety | 0.05 [-0.05, 0.15] | 0.24 | 0.29 | |
| | Internal shame | 0.09 [-0.10, 0.28] | 0.35 | 0.34 | |
| | External shame | 0.06 [-0.16, 0.27] | 0.17 | 0.60 | |
| | Psychological flexibility | 0.24 [0.00, 0.48] | 0.49 | 0.05* | |
| | Self-compassion | 0.00 [-0.12, 0.12] | 0.00 | 0.99 | |
| | Giving compassion | -0.12 [-0.24, 0.00] | -0.38 | 0.05* | |
| | Receiving compassion | 0.01 [-0.11, 0.14] | 0.05 | 0.83 | |
| | | $R = 0.66$, $F (9, 30) = 2.57$* | | | 0.44* |
| | | $\Delta R^2 = 0.18$, $F$ change $= 2.45$ | | | |
| Step 5 | | | | | |
| | Mean maternal age | -0.13 [-0.42, 0.15] | -0.13 | 0.34 | |
| | Attachment avoidance | 0.08 [-0.01, 0.18] | 0.36 | 0.09 | |
| | Attachment anxiety | 0.09 [-0.00, 0.18] | 0.40 | 0.06 | |
| | Internal shame | 0.17 [-0.00, 0.35] | 0.67 | 0.05 | |

| | | | | |
|---|---|---|---|---|
| External shame | -0.03 [-0.23, 0.16] | -0.09 | 0.75 | |
| Psychological flexibility | 0.11 [-0.11, 0.33] | 0.23 | 0.30 | |
| Self-compassion | -0.06 [-0.17, 0.05] | -0.21 | 0.27 | |
| Giving compassion | -0.13 [-0.23, -0.02] | -0.39 | 0.02* | |
| Receiving compassion | 0.12 [-0.03, 0.25] | 0.41 | 0.11 | |
| Depression | -0.51 [-1.12, 0.10] | -0.40 | 0.10 | |
| Anxiety | 0.05 [-0.55, 0.64] | 0.03 | 0.87 | |
| Stress | -0.50 [-1.06, 0.05] | -0.53 | 0.08 | |
| | $R$ = 0.79, $F$ (12, 27) = 3.68* | | | 0.62* |
| | $\Delta R^2$ = 0.19, $F$ change = 4.23* | | | |

*Note.* * $p \le 0.05$, ** $p \le 0.01$, *** $p \le 0.001$, ª $p < 0.06$ (approaching significance).

## 4. Discussion

The aim of this study was to deepen understanding of the relationships between prenatal variables and self-reported emotional availability. Consistent with previous research on observational EA [28, 74-77], more self-reported EA was related to more adult security and better psychological adjustment (less anxiety, depression, and stress). More prenatal attachment avoidance was related to more self-reported hostility with baby at 6-months postpartum. More prenatal internal shame was uniquely related to more hostility at 6-months, as well as reduced attunement at 6-months postpartum. More prenatal depression was related to less self-reported child involvement at 6-months. Even though previous research that shows attachment avoidance, postpartum depression [78, 79], and shame [29] are associated with less optimally responsive parenting, this study extends previous research by showing that the relationships exist prenatally.

One unusual finding was observed in the data. More prenatal external shame and more prenatal stress correlated with more self-reported child involvement at 3-months postpartum. Previous research shows more external shame is related to more psychological symptoms in adults [25, 65, 80], and more perinatal stress is correlated with poorer postpartum psychological adjustment and suboptimal relationship with baby [16-18]. It may be that more prenatal stress may propel a pregnant woman to be more aware of her pregnancy, her current support networks, and who she can turn to help her cope when the baby is born. As the focus of external shame is on the other – whereas internal shame is on the self – pregnant women with more external shame may be focused on displaying desirable qualities to source support for her now, and for when her baby is born [39, 81, 82]. As the pregnant women is focused on other people, she may turn this externally focused attention towards her baby who, in turn, responds to the mother displaying enjoyment in the interaction [10, 69]. At 6-months postpartum, mothers who already gathered their social support in pregnancy may be adjusting better to becoming a mother at 6-months and feel less hostile towards baby. As nearly half of the participants were first-time mothers (43.6%), future research exploring these relationships with a larger sample size of mothers (first/second/third/fourth) may provide further understanding of these relationships.

### 4.1 Limitations

The findings need to be considered in light of several limitations. First, the power in the study was very low given the sample size. The pregnancy survey had enough power but not the postnatal surveys at 3- and 6-months postpartum. The results should be interpreted with a great degree of

caution. Second, most of the participants were married, educated, and Caucasian pregnant women. The results may be biased towards women from a higher socioeconomic status and may not be directly applicable to women from different backgrounds and cultures. Future research will need to engage women from a variety of different cultures and backgrounds to increase the reliability of these findings. Third, this study relied on significant commitment from the participants at 3 time points. Although not unusual, there was a substantial drop in participation across the time points. This may limit the capacity to extrapolate the findings to mothers given the low participation in the postpartum period.

### *4.2 Clinical Implications*

The findings have interesting clinical implications. First, for pregnant women with higher levels of avoidance in their attachment, internal shame, and depression, they may need more support during this transition to motherhood to support optimal mother-infant relationship outcomes. Even though higher prenatal psychological flexibility and self-compassion were related to less postpartum psychological distress in this research, giving compassion towards others was associated with decreased self-reported maternal hostility and better self-reported affect quality at 6-months postpartum. As more giving compassion towards others was related to better self-reported affect quality with baby, focusing on enhancing women's capacity to cultivate compassion may be beneficial for her relationship with her baby. Higher compassion towards others may equip the mother with skills in approaching her infant in a sensitive, empathic, and warm (non-hostile) manner which can create the foundation for a genuinely affectively positive, healthy, and enjoyable emotional connection [10, 69]. This research provides further support for the evidence on compassion-focused interventions, particularly for women in the perinatal period [47]. Clinicians working with pregnant women may want to consider a referral to a practitioner who incorporate strategies from Acceptance and Commitment Therapy (ACT) and/or Compassion-focused Therapy (CFT).

### 5. Conclusions

The results of this study support the larger body of research on the significance of the relationships between the prenatal period and postpartum outcomes. This research extends previous literature by uniquely showing that prenatal maternal attachment, shame, and compassion may be related to self-reported emotional availability at 3- and 6-months postpartum. Pregnant woman with higher levels of prenatal attachment avoidance, shame, and depression may benefit from prenatal compassion-focused interventions in order to support their psychological adjustment to motherhood, and relationship with her baby. As the study was not adequately powered, further research is needed to support these findings. It is hoped that the knowledge gained from this study will contribute to enhancing prenatal care pathways to promote optimal emotional availability, and potentially minimise maladaptive child and family outcomes.

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## Author Contributions

All authors contributed equally to this project.

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## Competing Interests

The authors have declared that no competing interests exist.

## References

1. Kirby JN. Nurturing family environments for children: Compassion-focused parenting as a form of parenting intervention. Educ Sci. 2020; 10: 3.
2. Bornstein MH, Suwalsky JTD, Breakstone DA. Emotional relationships between mothers and infants: Knowns, unknowns, and unknown unknowns. Dev Psychopathol. 2012; 24: 113-123.
3. Kirby JN. The role of mindfulness and compassion in enhancing nurturing family environments. Clin Psychol. 2016; 23: 142-157.
4. Biringen Z, Easterbrooks MA. The integration of emotional availability into a developmental psychopathology framework: Reflections on the special section and future directions. Dev Psychopathol. 2012; 24: 137-142.
5. Biringen Z, Derscheid D, Vliegen N, Closson L, Easterbrooks M. Emotional availability (EA): Theoretical background, empirical research using the EA scales, and clinical applications. Dev Rev. 2014; 34: 114-167.
6. Biringen Z, Robinson J, Emde R. Emotional availability scales (3rd ed.). 1998. Available from: https://emotionalavailability.com/.
7. Easterbrooks AM, Biringen Z. Guest editors' introduction to the special issue: Mapping the terrain of emotional availability and attachment. Attach Hum Dev. 2000; 2: 123-129.
8. Barfoot J, Meredith P, Ziviani J, Whittingham K. Parent-child interactions and children with cerebral palsy: An exploratory study investigating emotional availability, functional ability, and parent distress. Child Care Health Dev. 2017; 43: 812-822.
9. Ziv Y, Aviezer O, Gini M, Sagi A, Karie NK. Emotional availability in the mother-infant dyad as related to the quality of infant-mother attachment relationship. Attach Hum Dev. 2000; 2: 149-169.
10. Vliegen N, Luyten P, Biringen Z. A multimethod perspective on emotional availability in the postpartum period. Parent Sci Pract. 2009; 9: 228-243.

11. Botha E, Helminen M, Kaunonen M, Lubbe W, Joronen K. Mothers' parenting self-efficacy, satisfaction and perceptions of their infants during the first days postpartum. Midwifery. 2020; 88: 102760.

12. Newman LK, Stevenson CS, Bergman LR, Boyce P. Borderline personality disorder, mother-infant interaction and parenting perceptions: Preliminary findings. Aust N Z J Psychiatry. 2007; 41: 598-605.

13. Hollins Martin CJ, Anderson L, Martin CR. A scoping review to determine themes that represent perceptions of self as mother ('ideal mother' vs 'real mother'). J Reprod Infant Psychol. 2019; 37: 224-241.

14. Baines T, Wittkowski A, Wieck A. Illness perceptions in mothers with postpartum depression. Midwifery. 2013; 29: 779-786.

15. Jones JD, Cassidy J, Shaver PR. Parents' self-reported attachment styles: A review of links with parenting behaviors, emotions, and cognitions. Pers Soc Psychol Rev. 2015; 19: 44-76.

16. Crugnola CR, Gazzotti S, Spinelli M, Ierardi E, Caprin C, Albizzati A. Maternal attachment influences mother-infant styles of regulation and play with objects at nine months. Attach Hum Dev. 2013; 15: 107-131.

17. Isosävi S, Flykt M, Belt R, Posa T, Kuittinen S, Puura K, et al. Attachment representations among substance-abusing women in transition to motherhood: Implications for prenatal emotions and mother-infant interaction. Attach Hum Dev. 2016; 18: 391-417.

18. Negrão M, Pereira M, Soares I, Mesman J. Maternal attachment representations in relation to emotional availability and discipline behaviour. Eur J Dev Psychol. 2016; 13: 121-137.

19. Slomian J, Emonts P, Vigneron L, Acconcia A, Glowacz F, Reginster JY, et al. Identifying maternal needs following childbirth: A qualitative study among mothers, fathers and professionals. BMC Pregnancy Childbirth. 2017; 17: 213.

20. Liss M, Schiffrin HH, Rizzo KM. Maternal guilt and shame: The role of self-discrepancy and fear of negative evaluation. J Child Fam Stud. 2013; 22: 1112-1119.

21. O'Higgins M, Roberts ISJ, Glover V, Taylor A. Mother-child bonding at 1 year; associations with symptoms of postnatal depression and bonding in the first few weeks. Arch Womens Ment Health. 2013; 16: 381-389.

22. Faisal-Cury A, Bertazzi Levy R, Kontos A, Tabb K, Matijasevich A. Postpartum bonding at the beginning of the second year of child's life: The role of postpartum depression and early bonding impairment. J Psychosom Obstet Gynaecol. 2020; 41: 224-230.

23. Hahn-Holbrook J, Cornwell-Hinrichs T, Anaya I. Economic and health predictors of national postpartum depression prevalence: A systematic review, meta-analysis, and meta-regression of 291 studies from 56 countries. Front Psychiatry. 2018; 8: 248.

24. Slomian J, Honvo G, Emonts P, Reginster JY, Bruyère O. Consequences of maternal postpartum depression: A systematic review of maternal and infant outcomes. Womens Health. 2019; 15: 1745506519844044.

25. Kim S, Thibodeau R, Jorgensen RS. Shame, guilt, and depressive symptoms: A meta-analytic review. Psychol Bull. 2011; 137: 68-96.

26. Caldwell J, Meredith P, Whittingham K, Ziviani J. Shame and guilt in the postnatal period: A systematic review. J Reprod Infant Psychol. 2021; 39: 67-85.

27. Pinto-Gouveia J, Matos M. Can shame memories become a key to identity? The centrality of shame memories predicts psychopathology. Appl Cogn Psychol. 2011; 25: 281-290.

28. Matos M, Pinto-Gouveia J, Duarte C. Internalizing early memories of shame and lack of safeness and warmth: The mediating role of shame on depression. Behav Cogn Psychother. 2013; 41: 479-493.
29. Gilbert P, Kirby J. Psychotherapy for the 21st century: An integrative, evolutionary, contextual, biopsychosocial approach. Psychol Psychother. 2019; 92: 164-189.
30. Beck CT. Birth trauma: In the eye of the beholder. Nurs Res. 2004; 53: 28-35.
31. Hauck Y, Irurita V. Incompatible expectations: The dilemma of breastfeeding mothers. Health Care Women Int. 2003; 24: 62-78.
32. Hauck Y, Langton D, Coyle K. The path of determination: Exploring the lived experience of breastfeeding difficulties. Breastfeed Rev. 2002; 10: 5-12.
33. Taylor EN, Wallace LE. For shame: Feminism, breastfeeding advocacy, and maternal guilt. Hypatia. 2012; 27: 76-98.
34. Asiodu IV, Waters CM, Dailey DE, Lyndon A. Infant feeding decision-making and the influences of social support persons among first-time African American mothers. Matern Child Health J. 2017; 21: 863-872.
35. Dunford E, Granger C. Maternal guilt and shame: Relationship to postnatal depression and attitudes towards help-seeking. J Child Fam Stud. 2017; 26: 1692-1701.
36. McIntoshma J. The experience of motherhood and the development of depression in the postnatal period. J Clin Nurs. 1993; 2: 243-249.
37. Rørtveit K, Aström S, Severinsson E. The meaning of guilt and shame: A qualitative study of mothers who suffer from eating difficulties. Int J Ment Health Nurs. 2010; 19: 231-239.
38. Russell S. Barriers to care in postnatal depression. Community Pract. 2006; 79: 110-111.
39. Gilbert P. What is shame? Some core issues and controversies. In: Shame: Interpersonal behavior psychopathology, and culture. New York: Oxford University Press; 1998. pp.3-38.
40. Gilbert P. Body shame: A biopsychosocial conceptualisation and overview, with treatment implications. In: Body shame: Conceptualisation, research and treatment. London: Routledge; 2002. pp.3-30.
41. Negron R, Martin A, Almog M, Balbierz A, Howell EA. Social support during the postpartum period: Mothers' views on needs, expectations, and mobilization of support. Matern Child Health J. 2013; 17: 616-623.
42. Slade A. Parental reflective functioning: An introduction. Attach Hum Dev. 2005; 7: 269-281.
43. Gilbert P. The evolution of shame as a marker for relationship security. In: The self-conscious emotions: Theory and research. New York: Guilford; 2007. pp.283-309.
44. Branjerdporn G, Meredith P, Strong J, Garcia J. Associations between maternal-foetal attachment and infant developmental outcomes: A systematic review. Matern Child Health J. 2017; 21: 540-553.
45. Gilbert P. Compassion focused therapy: Distinctive features. London: Routledge; 2010.
46. Gilbert P. The origins and nature of compassion focused therapy. Br J Clin Psychol. 2014; 53: 6-41.
47. Mitchell AE, Whittingham K, Steindl S, Kirby J. Feasibility and acceptability of a brief online self-compassion intervention for mothers of infants. Arch Womens Ment Health. 2018; 21: 553-561.
48. Cree M. Compassion focused therapy with perinatal and mother-infant distress. Int J Cogn Psychother. 2010; 3: 157-171.

49. Saleh ASEM. Acceptance-focused processes and self-compassion protect pregnant women from developing postpartum depressive and anxiety symptoms and improve relationships with health caregivers. Evid Based Nurs. 2020; 23: 26.

50. Monteiro F, Fonseca A, Pereira M, Alves S, Canavarro MC. What protects at-risk postpartum women from developing depressive and anxiety symptoms? The role of acceptance-focused processes and self-compassion. J Affect Disord. 2019; 246: 522-529.

51. Felder JN, Lemon E, Shea K, Kripke K, Dimidjian S. Role of self-compassion in psychological well-being among perinatal women. Arch Womens Ment Health. 2016; 19: 687-690.

52. Cree M. The compassionate mind approach to postnatal depression: Using compassion focused therapy to enhance mood, confidence and bonding. England: Robinson; 2016.

53. Hulsbosch LP, Nyklíček I, Potharst ES, Meems M, Boekhorst MGBM, Pop VJM. Online mindfulness-based intervention for women with pregnancy distress: Design of a randomized controlled trial. BMC Pregnancy Childbirth. 2020; 20: 159.

54. Dhillon A, Sparkes E, Duarte RV. Mindfulness-based interventions during pregnancy: A systematic review and meta-analysis. Mindfulness. 2017; 8: 1421-1437.

55. Hall HG, Beattie J, Lau R, East C, Anne Biro M. Mindfulness and perinatal mental health: A systematic review. Women Birth. 2016; 29: 62-71.

56. Lever Taylor B, Cavanagh K, Strauss C. The effectiveness of mindfulness-based interventions in the perinatal period: A systematic review and meta-analysis. PLoS One. 2016; 11: e0155720.

57. Matvienko-Sikar K, Lee L, Murphy G, Murphy L. The effects of mindfulness interventions on prenatal well-being: A systematic review. Psychol Health. 2016; 31: 1415-1434.

58. Grigoriadis S, de Camps Meschino D, Barrons E, Bradley L, Eady A, Fishell A, et al. Mood and anxiety disorders in a sample of canadian perinatal women referred for psychiatric care. Arch Womens Ment Health. 2011; 14: 325-333.

59. Swenson S, Ho GW, Budhathoki C, Belcher HM, Tucker S, Miller K, et al. Parents' use of praise and criticism in a sample of young children seeking mental health services. J Pediatr Health Care. 2016; 30: 49-56.

60. Poehlmann J, Hane A, Burnson C, Maleck S, Hamburger E, Shah PE. Preterm infants who are prone to distress: Differential effects of parenting on 36-month behavioral and cognitive outcomes. J Child Psychol Psychiatry. 2012; 53: 1018-1025.

61. Cohen A. Prognosis for schizophrenia in the Third World: A reevaluation of cross-cultural research. Cult Med Psychiatry. 1992; 16: 53-75.

62. Lo C, Walsh A, Mikulincer M, Gagliese L, Zimmermann C, Rodin G. Measuring attachment security in patients with advanced cancer: Psychometric properties of a modified and brief Experiences in Close Relationships scale. Psychooncology. 2009; 18: 490-499.

63. Brennan KA, Clark CL, Shaver PR. Self-report measurement of adult attachment: An integrative review. In: Attachment theory and close relationships. New York: Guilford; 1998. pp.46-76.

64. Cook DR. The internalized shame scale manual. Menomonie: Channel Press; 1993.

65. Goss K, Gilbert P, Allan S. An exploration of shame measures-I: The other as Shamer scale. Pers Individ Dif. 1994; 17: 713-717.

66. Bond FW, Hayes SC, Baer RA, Carpenter KM, Guenole N, Orcutt HK, et al. Preliminary psychometric properties of the acceptance and action questionnaire–II: A revised measure of psychological inflexibility and experiential avoidance. Behav Ther. 2011; 42: 676-688.

67. Gilbert P, Catarino F, Duarte C, Matos M, Kolts R, Stubbs J, et al. The development of compassionate engagement and action scales for self and others. J Compassionate Health Care. 2017; 4: 4.

68. Lovibond SH, Lovibond PF. Manual for the depression anxiety stress scales. Sydney: Psychology Foundation of Australia; 1995.

69. Biringen Z, Altenhofen S, Aberle J, Baker M, Brosal A, Bennett S, et al. Emotional availability, attachment, and intervention in center-based child care for infants and toddlers. Dev Psychopathol. 2012; 24: 23-34.

70. Flykt M, Punamaki RL, Belt R, Biringen Z, Salo S, Posa T, et al. Maternal representations and emotional availability among drug-abusing and nonusing mothers and their infants. Infant Ment Health J. 2012; 33: 123-138.

71. Cohen J. Statistical power analysis for the behavioral sciences. New York: Routledge; 1988.

72. Whittingham K, Boyd RN, Sanders MR, Colditz P. Erratum to: Parenting and Prematurity: Understanding Parent Experience and Preferences for Support. J Child Fam Stud. 2015; 24: 1529.

73. Duncan C, Cacciatore J. A systematic review of the peer-reviewed literature on self-blame, guilt, and shame. Omega. 2015; 71: 312-342.

74. Gilbert P, Irons C. Shame, self-criticism, and self-compassion in adolescence. In: Adolescent emotional development and the emergence of depressive disorders. Cambridge: Cambridge University Press; 2009. pp.195-214.

75. Irons C, Gilbert P, Baldwin MW, Baccus JR, Palmer M. Parental recall, attachment relating and self-attacking/self-reassurance: Their relationship with depression. Br J Clin Psychol. 2006; 45: 297-308.

76. Matos M, Pinto-Gouveia J. Shamed by a parent or by others: The role of attachment in shame memories relation to depression. Int J Psychol Psychol Ther. 2014; 14: 217-244.

77. Matos M, Pinto-Gouveia J, Costa V. Understanding the importance of attachment in shame traumatic memory relation to depression: The impact of emotion regulation processes. Clin Psychol Psychother. 2013; 20: 149-165.

78. Carter AS, Briggs-Gowan MJ, Davis NO. Assessment of young children's social-emotional development and psychopathology: Recent advances and recommendations for practice. J Child Psychol Psychiatry. 2004; 45: 109-134.

79. Goodman G, Hans SL, Bernstein VJ. Mother expectation of bother and infant attachment behaviors as predictors of mother and child communication at 24 months in children of methadone-maintained women. Infant Ment Health J. 2005; 26: 549-569.

80. Matos M, Pinto-Gouveia J, Gilbert P, Duarte C, Figueiredo C. The other as shamer scale – 2: Development and validation of a short version of a measure of external shame. Pers Individ Dif. 2015; 74: 6-11.

81. Gilbert P. The relationship of shame, social anxiety and depression: The role of the evaluation of social rank. Clin Psychol Psychother. 2000; 7: 174-189.

82. Gilbert P. Compassion-focused therapy: Preface and introduction for special section. Br J Clin Psychol. 2014; 53: 1-5.
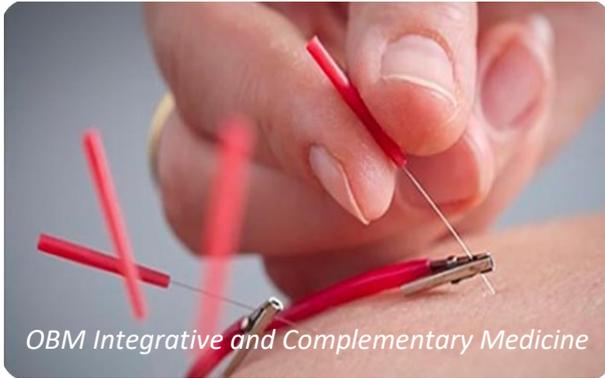
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