



Journal of Reproductive and Infant Psychology

ISSN: 0264-6838 (Print) 1469-672X (Online) Journal homepage: https://www.tandfonline.com/loi/cjri20

# Postpartum-specific anxiety and maternal bonding: Further evidence to support the use of childbearing specific mood tools

Victoria Fallon, Sergio Alessandro Silverio, Jason Christian Grovenor Halford, Kate Mary Bennett & Joanne Allison Harrold

To cite this article: Victoria Fallon, Sergio Alessandro Silverio, Jason Christian Grovenor Halford, Kate Mary Bennett & Joanne Allison Harrold (2019): Postpartum-specific anxiety and maternal bonding: Further evidence to support the use of childbearing specific mood tools, Journal of Reproductive and Infant Psychology

To link to this article: https://doi.org/10.1080/02646838.2019.1680960



Published online: 23 Oct 2019.

4
<u> </u>

Submit your article to this journal 🗹



View related articles 🗹



則 🛛 View Crossmark data 🗹



Check for updates

# Postpartum-specific anxiety and maternal bonding: Further evidence to support the use of childbearing specific mood tools

Victoria Fallon D<sup>a</sup>, Sergio Alessandro Silverio D<sup>b</sup>, Jason Christian Grovenor Halford<sup>a</sup>, Kate Mary Bennett D<sup>a</sup> and Joanne Allison Harrold D<sup>a</sup>

<sup>a</sup>Department of Psychological Sciences, University of Liverpool, Liverpool, UK; <sup>b</sup>Elizabeth Garrett Anderson Institute for Women's Health, University College London, London, UK

#### ABSTRACT

**Background**: Research examining the relationship between postpartum anxiety and maternal bonding is limited by the use of general measures of anxiety which may predict perinatal outcomes less effectively than childbearing specific tools.

**Objectives:** This study aimed to investigate the predictive validity of the Postpartum Specific Anxiety Scale [PSAS] and examine whether it is a more effective predictor of maternal bonding than general measures of anxiety.

**Methods**: Two hundred and sixty one mothers (≤6-months postpartum) completed the PSAS alongside general anxiety and depression measures. Maternal bonding was examined via the Postpartum Bonding Questionnaire [PBQ] two-weeks later.

**Results**: Hierarchical regression models demonstrated that higher levels of postpartum specific anxiety were associated with impaired overall bonding scores, and subscales of impaired general bond, rejection and anger, and infant focused anxieties. As hypothesised, the PSAS predicted unique variance in maternal bonding in these domains after controlling for general measures of anxiety and depression.

**Conclusion**: These findings provide further evidence to support the predictive utility of the PSAS and the use of childbearing-specific measures of mood when predicting perinatal outcomes.

#### **ARTICLE HISTORY**

Received 13 February 2019 Accepted 9 October 2019

#### **KEYWORDS**

Attachment; emotional; infancy; postnatal care; quantitative methods

#### Introduction

Studies addressing postpartum anxiety and depression usually employ general measures of mood which are rarely validated for postpartum use and artificially skew scores. Scores from general measures may be over-represented due to the inclusion of somatic items (e.g. I feel tired/uncomfortable) or under-represented due to the omission of items which capture the unique challenges associated with motherhood (Fallon, Halford, Bennett, & Harrold, 2016). Recent literature demonstrates while the form of emotional distress experienced in the postpartum is usually identical to other times of life (e.g. major depression disorder, panic, phobia, GAD), the content is maternal or infant focused in nature, with feelings and concerns centred around parenting competence, infant safety and welfare, and adjustment to changes in appearance, daily activities, and social roles with a new infant (Brockington, Macdonald, & Wainscott, 2006; Highet, Stevenson, Purtell, & Coo, 2014; Phillips, Sharpe, & Matthey, 2007; Phillips, Sharpe, Matthey, & Charles, 2009).

These oversights have been addressed in the depression literature in pregnancy and the postpartum; and the anxiety literature, but only in pregnancy. For instance, measures such as the Postpartum Depression Screening Scale (Pereira et al., 2013) and the Perinatal Depression Inventory (Brodey et al., 2016) have been developed and studies using these have found they provide a more precise measurement of symptoms than a general measure (Brodey et al., 2016; Pereira et al., 2013). The prenatal anxiety literature extends this, consistently finding measures which capture pregnancy-specific anxiety, such as fear of birth, concerns around bearing a handicapped child, or changes in appearance; predict adverse maternal and infant health and behavioural outcomes more effectively than a general measure. It is theorised that this is because items within temporally specific measures are more tightly linked to the period of childbearing and subsequent outcomes (Guardino & Schetter, 2014). This is evident across studies of pre-term birth (Dunkel Schetter, 2011), infant cognitive and motor performance (Davis & Sandman, 2010), infant temperament (Huizink, Robles De Medina, Mulder, Visser, & Buitelaar, 2002), and infant feeding (Fairlee, Gillman, & Rich-Edwards, 2009). However, findings like these are yet to be replicated in anxiety studies using postpartum populations due to a lack of postpartumspecific anxiety tools.

The Postpartum Specific Anxiety Scale (PSAS; Fallon, Halford, Bennett, & Harrold, 2016) is a recently developed measure which demonstrated initial validity and reliability in one large UK sample, and more recently a smaller Turkish sample (Duran, 2019). The 51-item measure assesses four domains of anxiety, specific to the postpartum period. The predictive validity of the measure has recently been examined and confirmed relative to infant feeding outcomes and behaviours where it was recommended the measure should be examined against a broader range of maternal and infant health and behavioural outcomes (Fallon, Halford, Bennett, & Harrold, 2018)

One outcome which is deemed essential for the development of healthy early relationships is maternal bonding. Bonding represents the emotional attachment between the primary caregiver and the infant which develops shortly after birth. It is a biological and adaptive process which enables satisfaction of an infants' needs for protection and nurture by the mother (Schmoeger, Deckert, Wagner, Sirsch, & Willinger, 2018). The love of a mother for her infant is considered to be the core experience of the mother-to-infant bond. Bonding also underpins several maternal dispositions towards the infant including pleasure in proximity, tolerance, need gratification, and knowledge acquisition (Bussel & Spitz, 2010). A number of studies demonstrate the significance of maternal anxiety on maternal bonding behaviours and the mother-infant relationship (e.g. Feldman et al., 2009; Nicol-Harper, Harvey, & Stein, 2007), however, this is under-researched when compared to postpartum depression and has predominately been examined in clinical populations. The aims of this paper are as follows: 1) to investigate the predictive validity of the PSAS in the context of maternal bonding using a short-term prospective design; and 2) to examine whether the PSAS may be a more effective predictor of maternal bonding than general measures of anxiety. It is hypothesised that after controlling for the

effects of general anxiety and depression, postpartum-specific anxiety will predict unique variance in maternal bonding scores.

#### **Methods**

#### **Participants**

Mothers of infants aged between birth and six months postpartum were recruited to a survey via online advertisements containing a link to the Qualtrics software. The participants were recruited through UK and international parenting forums (Mumsnet, Netmums), social media platforms (Facebook, Twitter), and other relevant websites via advertisements providing a link to the Qualtrics survey software. Prior to the main survey, an electronic consent form and information sheet were provided with a tick box to confirm that the main points had been read and understood. A screening question enquired whether the participant was a mother to an infant aged between 0 and 6 months; only a positive response allowed entry to the main survey. A sub-sample of self-selecting mothers then completed a follow-up questionnaire after two weeks. Responses were linked via a unique ID embedded in the survey software to preserve anonymity. The link to the follow-up questionnaire was only active on the day it was distributed. Participants completing both questionnaires received a reimbursement of ten pounds. Non-duplication of participation was assured via a 'prevent ballot box stuffing' option embedded in the survey software.

#### Measures

#### **Demographics**

Comprehensive maternal and infant characteristics questions were asked at the start of the main questionnaire (see Table 1 for means and frequencies). Occupational prestige, educational attainment, size of household, and living status were combined to create a composite measure of socio-economic status [SES] for analyses. This method has been used in previous studies of this nature (Fallon, Halford, Bennett, & Harrold, 2018).

# *The Postpartum-Specific Anxiety Scale (PSAS; Fallon, Halford, Bennett, & Harrold,* **2016**)

The PSAS is a 51-item measure of the frequency of maternal and infant orientated anxieties experienced during the previous week. It uses a 4-point Likert Scale with response options ranging from '1-not at all' to "4-almost always (possible ranges 51–204). It contains four distinct constructs specific to the first 6 months after birth. 'Competence and attachment anxieties' (15 items) concerns anxieties relating to maternal self-efficacy, parenting competence and the mother-infant relationship. 'Safety and welfare anxieties' (11 items) encompasses fears about infant illnesses, accidents, and cot death. 'Practical baby care anxieties' (7 items) covers anxieties that are specific to infant care such as feeding, sleeping, and general routine. 'Psychosocial adjustment to motherhood' (18 items) addresses postpartum adjustment concerns including management of personal appearance, relationships and support, work and finances, and sleep. In an initial study in the UK, the PSAS demonstrated good reliability (internal and test-retest) and validity (face, content, construct, convergent, and predictive) and was comprehensible

## 4 😉 V. FALLON ET AL.

#### Table 1. Maternal and infant characteristics (N = 261).

Maternal Characteristic	Value	Infant Characteristic	Value
Maternal age (mean years $\pm$ SD)	31.25 (±	Infant age (mean weeks ± SD)	16.10 (±6.43)
Country of Residence (N/%)	4.50)	Gender (N/%)	
UK	239 (91.6)	Male	146 (55.9)
Ireland	4 (1.5)	Female	115 (44.1)
US	4 (1.5)	Birth order (N/%)	
Australia & NZ	2 (0.8)	1 <sup>st</sup>	121 (46.4)
Other European	9 (3.4)	2 <sup>rd</sup>	104 (39.8)
Other Non-European Marital Status (N/%)	3 (1.2)	3 A <sup>th</sup>	27 (10.3)
Married	195 (74 7)	5 <sup>th</sup> and after	5 (1 9)
Co-habiting	57 (21.8)	Birth Weight (mean kg $\pm$ SD)	3.50 (0.69)
Single	7 (2.7)	Infant BMI percentile (mean $\pm$ SD)	30.80 (37.0)
Separated/Divorced/Widowed	2 (0.8)	Timing of Birth (N/%)	
Occupation (N/%)		Premature (<37 weeks)	7 (2.7)
Managers, Directors and Senior Officials	6 (2.3)	Early Term (>37 < 39)	49 (18.7)
Professionals	34 (13.0)	Full Term (>39 < 41)	124 (47.5)
Skilled Trades	23 (8.8)	Late lerm $(>41 < 42)$	// (29.5)
Caring, Leisure and Other Service	22 (8.4)	Post Term (>42 Weeks) Multiple Birth (N/%)	4 (1.5)
Process Plant and Machine Operatives	2 (0.0)		4 (1 5)
Flementary Occupations	6 (2.3)	No	257 (98.5)
Housewife	116 (44.4)	EBF (N/%)	257 (50.5)
	,	Yes	176 (67.4)
		No	85(32.6)
		Any BF (N/%)	
Not in paid occupation	21 (8.0)	Yes	217 (83.1)
Educational Attainment (N/%)		No	44 (16.9)
Postgraduate education	64 (25.2)	Maternal Bonding Behaviours (mean/	Value
		SD/Tange/	Value
Undergraduate education	123 (46.6)	Overall bonding	13.62 (±11.09); 0-51
A-levels or equivalent college education	50 (18.9)	General bond	7.03 (±5.81); 0-29
GCSEs or equivalent secondary school	16 (6.1)	Rejection and anger	3.03 (±3.30); 0-15
Other Qualification	7 (3.8)	Infant focused anxieties	3.51 (±2.80); 0-14
No qualifications	1 (0.4)	Risk of harm	0.49 (±2.64); 0-2
Living Status (N/%)		Mental Health Measures (mean/SD/ range)	Value
Own Property	180 (68 0)	Postpartum Specific Anviety Scale	105 53 (+23 98).
own rioperty	100 (00.5)	i ostpurtum specific mixiety scale	55-177
Rent privately	59 (22.6)	State Trait Anxiety Inventory – State	37.70 (±13.45); 20-79
Rent from the authority	11 (4.2)	State Trait Anxiety Inventory – Trait	42.91 (±13.41); 20-80
Live with parents	2 (0.9)	Beck Depression Inventory – II	14.83 (±10.11); 0-57
Other	9 (3.4)		
Size of Household (inc. participant) (N/%)			
2 people	7 (2.7)		
3 people	113 (43.3)		
4 people	102 (39.1)		
5 people 6 or more people	29 (11.1) 10 (3.8)		
Current Diagnosis of Anxiety/Depression	10 (0.0)		
Yes	27 (10 3)		
No	233 (89.3)		
Prefer not to say	1 (0.4)		
Maternal BMI (kg/m²) (mean ±SD)	27.00		
	(6.69)		

and acceptable to postpartum women. Cronbach's alpha for the overall measure in the current study was excellent ( $\alpha = 0.95$ ).

#### The Beck Depression Inventory-II (BDI-II; Beck, Steer, & Carbin, 1988)

The BDI is a 21-item measure of the severity of general depression experienced over the previous two weeks with response options ranging from 0 'no severity' to 3 'maximum severity' (range 0–63). Its reliability and validity has been evidenced across a large number of studies in both clinical and non-clinical populations.

# The Spielberger State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lushene, 1970)

The STAI is a 40-item measure of general anxiety. Both situational (state) and stable (trait) anxiety is measured on two 20-item subscales. Higher scores on each four-point Likert scale item indicate higher levels of anxiety (range 20–80 for each subscale). The STAI is a valid and reliable tool in both clinical and non-clinical populations (Meades & Ayers 2011).

# *The Postpartum Bonding Questionnaire (PBQ; Brockington, Macdonald, & Wainscott, 2006)*

The PBQ is used to screen for early indicators of mother-infant relationship disorders and consists of 25 statements with a six-point Likert scale ranging from 'Always' (0) to 'Never' (5) (range 0–125). High scores reflect a problematic mother- to-infant bond. The sum of the 25 items forms the total PBQ scale. There are four subscales indicating impaired general bonding (12 items) rejection and anger (seven items), infant-focused anxiety (4 items), and the risk of abuse (2 items). The lowest possible score on all scales is 0, 60 for the impaired bonding subscale, 35 for the rejection subscale, 20 for the anxiety subscale, and 10 for the abuse subscale. The PBQ has been validated in mothers with a healthy mother-infant relationship and mothers with bonding disorders (Van Bussel & Spitz, 2010).

#### Design and procedure

The study utilises data from a wider short-term prospective design (Fallon, Halford, Bennett, & Harrold, 2018) The main questionnaire included measures of maternal mental health (i.e. PSAS, STAI-S, STAI-T, BDI-II) as well as demographic information. Participants who voluntarily agreed to complete a follow-up questionnaire after exactly 2 weeks were contacted via an email containing the link to the follow-up survey (PBQ).

#### Method of analysis

To develop a parsimonious model, a range of potentially confounding maternal and infant characteristics were identified from previous literature (see Table 1). Bivariate analyses were conducted between each demographic variable in Table 1, the exposure of interest (i.e. PSAS scores), and the outcome of interest (i.e. bonding). Confounders significantly associated with both exposure and outcome at p < 0.1 level were included in the final regression models. Five hierarchical multiple regression analyses (HMR) were conducted to examine the association between PSAS scores (baseline) on maternal

6 🕒 V. FALLON ET AL.

bonding (follow-up) using the summed score of the overall PBQ and each of its four subscales respectively. Relevant confounders were to be entered in block one, with general measures of anxiety and depression in block two, and the PSAS in block three. As the PBQ was negatively skewed, a comparison between standard (untransformed regression coefficients) and the transformed (square root- top, log bottom) was conducted. As the results were analogous, the original untransformed results were presented.

### Results

1,282 mothers were recruited, with 62% (800) completing the main questionnaire (Table 1). A smaller sub-sample (33%; n = 261) then completed the PBQ two weeks later. Analyses were conducted on those who completed both surveys (n = 261). Mothers completing the main and follow-up surveys had higher SES scores ( $20.85 \pm 3.33$  vs  $20.23 \pm 3.59$ ; t = -2.38, *p* = .02) and were less likely to report current, clinical diagnoses of depression or anxiety (10.3% vs 14.1%,  $\chi^2 = 4.57$ , *p* = .03). No differences in infant characteristics were reported.

### Hierarchical multiple regressions: Table 2

No confounders were significantly associated with both exposure and outcome at the p < 0.1 level therefore none were included in final models.

### Overall mother-infant bond

The final regression model predicted 41% of the variance in overall bonding ( $R^2 = .0.41$ , F (4,256) = 44.21, p < .001). After controlling for general anxiety and depression, the PSAS uniquely explained 5% of the variance in scores and was positively associated with impaired overall bonding ( $\beta = .36$ , p < .001).

### General maternal bond

The final regression model predicted 35% of the variance in general maternal bond ( $R^2 = .0.35$ , F(4,256) = 34.63, p < .001). After controlling for general anxiety and depression, the PSAS uniquely explained 3% of the variance in scores and was positively associated with impaired general maternal bond ( $\beta = .28$ , p = .001)

### **Rejection and anger**

The final regression model predicted 30% of the variance in rejection and anger ( $R^2 = .0.30$ , F(4,256) = 26.84, p < .001). After controlling for general anxiety and depression, the PSAS uniquely explained 3% of the variance in scores and was positively associated with rejection and anger ( $\beta = .26$ , p = .004).

### Infant focused anxieties

The final regression model predicted 67% of the variance in infant focused anxieties ( $R^2 = .0.67$ , F(4,256) = 44.89, p < .001). After controlling for general anxiety and depression,

R <sup>2</sup> -change         F-change $\beta$ p           Total mother-infant bonding Step 1         .36         F (3, 257) = 49.00**         .37         <.001           STAI-S         .16         .14         .14         .14         .14         .14         .14         .14         .16         .14         .16         .14         .09         .40         .16         .14         .09         .40         .16         .14         .09         .40         .16         .14         .09         .40         .16         .14         .09         .40         .16         .14         .09         .40         .16         .14         .17         .13         .16         .14         .01         .17         .13         .17         .13         .17         .13         .17         .13         .17         .13         .17         .13         .27         F (3, 257) = 32.12**         .34         .002         .13         .29         .29         .001         .13         .29         .51         .13         .29         .51         .13         .29         .51         .13         .29         .51         .13         .29         .51         .14         .22         .51         .14         .22		Cumulative		Simultaneous	
Total mother-infant bonding         Step 1         BDI       .36       F (3, 257) = 49.00**       .37       <.001         STAI-5       .16       .14         STAI-T       .09       .40         Step 2       .92       .934       .936       <.001         General bond       .16       .14       .16       .14         Step 1       .99       .40       .99       .40         Step 1       .95A       .05       F (1, 256) = 19.34**       .36       <.001         STAI-T       .03       .77       .17       .13       .17       .13         Step 1       .03       .77       .03       .77       .03       .77         Step 2       .03       F (1, 256) = 10.79**       .28       .001       .02       .13       .29         STAI-T       .03       .77       .13       .29       .13       .29         STAI-T       .03       .77       .13       .29       .13       .29         STAI-T       .03       .62       .13       .29       .13       .29         STAI-T       .03       .62       .13       .29       .007       .14 <td< th=""><th></th><th>R<sup>2</sup>-change</th><th>F-change</th><th>β</th><th>р</th></td<>		R <sup>2</sup> -change	F-change	β	р
Step 1 BDI.36 $F(3, 257) = 49.00^{**}$ .37<.001STAI-S STAI-T.16.14STAI-T.09.40Step 2 PSAS.05 $F(1, 256) = 19.34^{**}$ .36<.001	Total mother-infant bonding				
BDI       .36       F (3, 257) = 49.00**       .37       <.001         STAI-S       .16       .14         STAI-T       .09       .40         Step 2       .95AS       .05       F (1, 256) = 19.34**       .36       <.001	Step 1				
STAI-S       .16       .14         STAI-T       .09       .40         Step 2       PSAS       .05       F (1, 256) = 19.34**       .36       <.001	BDI	.36	F (3, 257) = 49.00**	.37	<.001
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	STAI-S			.16	.14
Step 2 PSAS.05F $(1, 256) = 19.34^{**}$ .36<.001General bond.32F $(3, 257) = 41.02^{**}$ .38<.001	STAI-T			.09	.40
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Step 2				
General bond         Step 1         BDI       .32       F (3, 257) = 41.02**       .38       <.001	PSAS	.05	F (1, 256) = 19.34**	.36	<.001
Step 1       .32 $F(3, 257) = 41.02^{**}$ .38       <.001	General bond				
BDI.32 $F(3, 257) = 41.02^{**}$ .38<.001STAI-S.17.13STAI-T.03.77Step 2.03 $F(1, 256) = 10.79^{**}$ .28PSAS.03 $F(1, 256) = 10.79^{**}$ .28.001Rejection and anger.27 $F(3, 257) = 32.12^{**}$ .34.002STAI-S.13.29.13.29STAI-S.13.29.08.52Step 2.02 $F(1, 256) = 8.25^{**}$ .26.004Infant focused anxiety.02 $F(3, 257) = 46.02^{**}$ .29.007STAI-S.14.22.14.22STAI-T.19.08.34Step 2.14.22PSAS.10 $F(1, 256) = 44.89^{**}$ .53<.001	Step 1				
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	BDI	.32	F (3, 257) = 41.02**	.38	<.001
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	STAI-S			.17	.13
Step 2 PSAS.03 $F(1, 256) = 10.79^{**}$ .28.001Rejection and anger.27 $F(3, 257) = 32.12^{**}$ .34.002STAI-S.13.29STAI-S.13.29STAI-T.08.52Step 2 PSAS.02 $F(1, 256) = 8.25^{**}$ .26.004Infant focused anxiety.02 $F(3, 257) = 46.02^{**}$ .29.007STAI-S.14.22STAI-T.19.08Step 1 BDI.34 $F(3, 257) = 46.02^{**}$ .29.007STAI-S.14.22STAI-T.19.08Step 2 PSAS.10 $F(1, 256) = 44.89^{**}$ .53<.001	STAI-T			.03	.77
PSAS.03 $F(1, 256) = 10.79^{**}$ .28.001Rejection and angerStep 1BDI.27 $F(3, 257) = 32.12^{**}$ .34.002STAI-S.13.29STAI-T.08.52Step 2.02 $F(1. 256) = 8.25^{**}$ .26.004Infant focused anxiety.29.007STAI-S.14.22STAI-T.19.08Step 2.14.22PSAS.10 $F(1, 256) = 44.89^{**}$ .53<.001	Step 2				
Rejection and anger         Step 1         BDI       .27 $F(3, 257) = 32.12^{**}$ .34       .002         STAI-S       .13       .29         STAI-T       .08       .52         Step 2       .08       .52         PSAS       .02 $F(1, 256) = 8.25^{**}$ .26       .004         Infant focused anxiety       .27 $F(3, 257) = 46.02^{**}$ .29       .007         Step 1       .34 $F(3, 257) = 46.02^{**}$ .29       .007         BDI       .34 $F(3, 257) = 46.02^{**}$ .29       .007         Stal-S       .14       .22       .14       .22         STAI-T       .19       .08         Step 2       .10 $F(1, 256) = 44.89^{**}$ .53       <.001         Risk of harm       .10 $F(3, 257) = 0.80$ $19$ .36         STAI-S       .03       .85       .03       .85       .33         BDI       .01 $F(3, 257) = 0.80$ $19$ .36       .36       .38       .35         STAI-S       .03       .85       .33       .303       .85       .35       .36 <t< td=""><td>PSAS</td><td>.03</td><td>F (1, 256) = 10.79**</td><td>.28</td><td>.001</td></t<>	PSAS	.03	F (1, 256) = 10.79**	.28	.001
Step 1 BDI.27 $F(3, 257) = 32.12^{**}$ .34.002STAI-S.13.29STAI-T.08.52Step 2 PSAS.02 $F(1. 256) = 8.25^{**}$ .26.004Infant focused anxiety.02 $F(3, 257) = 46.02^{**}$ .29.007Step 1 BDI.34 $F(3, 257) = 46.02^{**}$ .29.007STAI-S STAI-T.14.22STAI-T.19.08Step 2 PSAS.10 $F(1, 256) = 44.89^{**}$ .53<.001	Rejection and anger				
BDI.27F $(3, 257) = 32.12^{**}$ .34.002STAI-S.13.29STAI-T.08.52Step 2.02F $(1. 256) = 8.25^{**}$ .26.004Infant focused anxiety.29.007Step 1.34F $(3, 257) = 46.02^{**}$ .29.007BDI.34F $(3, 257) = 46.02^{**}$ .29.007STAI-S.14.22STAI-T.19.08Step 2.10F $(1, 256) = 44.89^{**}$ .53<.001	Step 1				
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	BDI	.27	F (3, 257) = 32.12**	.34	.002
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	STAI-S			.13	.29
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	STAI-T			.08	.52
PSAS       .02       F (1. 256) = 8.25**       .26       .004         Infant focused anxiety       Step 1       .12       .007         BDI       .34       F (3, 257) = 46.02**       .29       .007         STAI-S       .14       .22         STAI-T       .19       .08         Step 2       .19       .08         PSAS       .10       F (1, 256) = 44.89**       .53       <.001	Step 2				
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	PSAS	.02	F (1. 256) = 8.25**	.26	.004
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Infant focused anxiety				
BDI       .34       F (3, 257) = 46.02**       .29       .007         STAI-S       .14       .22         STAI-T       .19       .08         Step 2       .10       F (1, 256) = 44.89**       .53       <.001	Step 1				
STAI-S       .14       .22         STAI-T       .19       .08         Step 2       PSAS       .10       F (1, 256) = 44.89**       .53       <.001	BDI	.34	F (3, 257) = 46.02**	.29	.007
STAI-T       .19       .08         Step 2       PSAS       .10       F (1, 256) = 44.89**       .53       <.001	STAI-S			.14	.22
Step 2       PSAS       .10       F (1, 256) = 44.89**       .53       <.001	STAI-T			.19	.08
PSAS       .10       F (1, 256) = 44.89**       .53       <.001         Risk of harm       Step 1       .01       F (3, 257) = 0.80      19       .36         BDI       .01       F (3, 257) = 0.80      19       .36         STAI-S       .03       .85         STAI-T       .15       .26         Step 2       .00       F (1, 256) = 0.62       .08       .43	Step 2				
Risk of harm         Step 1         BDI       .01       F (3, 257) = 0.80      19       .36         STAI-S       .03       .85         STAI-T       .15       .26         Step 2       .00       F (1, 256) = 0.62       .08       .43	PSAS	.10	F (1, 256) = 44.89**	.53	<.001
Step 1       .01       F (3, 257) = 0.80      19       .36         STAI-S       .03       .85         STAI-T       .15       .26         Step 2       .00       F (1, 256) = 0.62       .08       .43	Risk of harm				
BDI       .01       F (3, 257) = 0.80      19       .36         STAI-S       .03       .85         STAI-T       .15       .26         Step 2       .00       F (1, 256) = 0.62       .08       .43	Step 1				
STAI-S       .03       .85         STAI-T       .15       .26         Step 2       .00       F (1, 256) = 0.62       .08       .43	BDI	.01	F (3, 257) = 0.80	19	.36
STAI-T       .15       .26         Step 2       .00       F (1, 256) = 0.62       .08       .43	STAI-S			.03	.85
Step 2         PSAS         .00         F (1, 256) = 0.62         .08         .43	STAI-T			.15	.26
PSAS .00 F (1, 256) = 0.62 .08 .43	Step 2				
	PSAS	.00	F (1, 256) = 0.62	.08	.43

 Table 2. Hierarchical regression analysis demonstrating postpartum-specific anxiety as a predictor of mother-infant bonding (total and subscales) after controlling for general measures of mood.

Bold type indicates significant  $\beta$  and p values \*\* p < .001

the PSAS uniquely explained 10% of the variance in scores and was positively associated with infant focused anxieties ( $\beta = .53$ , p < .001).

#### **Risk of harm**

The final regression model predicted 10% of the variance in risk of harm and was not significant ( $R^2 = .0.11$ , F(4,256) = 0.62, p = .55).

#### Discussion

The findings indicate higher levels of postpartum-specific anxiety are related to more bonding impairments in mothers across the first 6-months of life. These results further demonstrate the predictive validity of the PSAS supporting literature which finds similar patterns in clinical populations (Feldman et al., 2009; Nicol-Harper, Harvey, & Stein, 2007).

8 🕒 V. FALLON ET AL.

The finding that sub-clinical anxiety symptoms are associated with postpartum bonding is important and warrants increased concern for mothers presenting with milder anxiety. Inconsistent results found in previous studies may be due to the use of general measures of anxiety (Edhborg, Nasreen & Kabir, 2011).

Analyses of the PBQ subscales revealed the PSAS explained unique variance in impaired general bond, rejection and anger, and infant focused anxieties. To situate the findings, it is important to note that mean anxiety (STAI) scores were comparable to other population studies of healthy community based samples of postpartum women (Dennis, Falah-Hassani, Brown, & Vigod, 2016). This indicates that these associations occur even when symptoms of anxiety are mild and within the range of normal functioning. The PBQ examines women's perceptions of their bond with their baby. It is possible that negative perceptions of bonding do not necessarily manifest in less sensitive caregiving behaviours in samples of healthy postpartum women. Previous work has found that perceptions of maternal-foetal attachment were predictive of postpartum maternal sensitivity (Shin, Park, & Mi, 2006), but future research is necessary to elucidate how perceptions of postpartum bonding may affect maternal caregiving. Nonetheless, identification of any factor which may consistently affect the mother-infant relationship is important given the implications for infant development.

The relationship between PSAS scores and infant focused anxiety is unsurprising given the PSAS focus on anxieties specific to the infant. There is inherent overlap between items in the PBQ 'infant focused anxiety' subscale and the PSAS which means results should be interpreted with some caution for this analysis. However, interestingly, STAI (state and trait) scores were unrelated to infant focused anxiety on the PBQ which casts further doubts about the suitability of the tool in postpartum populations. The only PBQ subscale unrelated to the PSAS (and the other measures of mood) was 'risk of harm' which seems reasonable and reassuring given the non-clinical sample.

As predicted, the PSAS explained unique variance in the data after controlling for general anxiety and depression. The PSAS was also the only measure of anxiety in the models which reached statistical significance. This reinforces the notion that postpartum-specific anxiety is a distinct construct which elicits *unique effects* on maternal and infant health and behaviour outcomes (Fallon, Halford, Bennett, & Harrold, 2018) and supports the pregnancy specific anxiety literature. In our previous work examining infant feeding, we drew on pregnancy specific anxiety theory to posit that this occurs because the items are grounded in the emotional and physical context of the postpartum period and are therefore more proximally linked to physiological stress responses than a general measure (Fallon, Halford, Bennett, & Harrold, 2018). The current findings corroborate this theory.

Interestingly, general depression was a significant predictor in the same models. It is important to note mean depression scores were slightly higher in this study than other population studies of healthy postpartum women and met the established cut-off for mild depression (Manian, Schmidt, Bornstein, & Martinez, 2013). Tietz and colleagues found impaired bonding in mothers with anxiety disorder may be due to concurrent sub-clinical depression (Tietz, Zietlow, & Reck, 2014). Alongside our findings, this emphasises the importance of sub-clinical symptoms of negative mood in new mothers for infant outcomes. However, the current results demonstrate postpartum-specific anxiety predicts impaired bonding independently of depressive symptoms. Future research is needed to clarify

whether comorbidity of sub-clinical depression and anxiety is particularly pertinent when considering maternal bonding. Finally, while the current study used a general measure of depression, the predictive validity of the PSAS would be much stronger if its predictive power was examined after controlling for postpartum-specific depression. Future work in this area should use a postpartum-specific depression measure rather than a general measure.

These findings are yet to be replicated over a longer follow-up period which is essential in confirming the predictive validity of the PSAS and the influence of anxiety on maternal bonding across the early years of life. Given the overlap between items on the PSAS and the infant-focused anxiety subscale, future research using the PSAS should replicate these findings using an alternative measure of maternal bonding. This study also had a self-selecting online sample consisting predominately of primiparous, non-working women, with good socio-economic backgrounds. Generalisability in diverse samples, particularly those at risk of postpartum mental health problems, is necessary. Notably, those lost to follow up in the current study had lower socio-economic status and higher levels of depression than those completing both surveys which further limits the generalisability of findings. Given that women with depression and from low-income backgrounds are at higher risk of bonding and attachment difficulties (Else-Quest, Hyde, & Clark, 2003; O'Higgins, St. James-Roberts, Glover, & Taylor, 2013), replication of these findings in those populations are critical.

The PSAS work to date has found postpartum-specific anxieties capture notable variance over and above generalised anxiety symptoms in both infant feeding (Fallon, Halford, Bennett, & Harrold, 2018), and now also maternal bonding. This adds to the evidence-base supporting the use of childbearing specific measures of mood in the postpartum period. Responsive feeding and bonding are fundamental to the health, behaviour, and development of the infant (Britton, Britton, & Gronwaldt, 2006). Satisfaction with feeding and bonding is also vital to maternal wellbeing (Fallon, Komninou, Harrold, Bennett, & Halford, 2017; Hurley, Black, Papas, & Caulfield, 2008). Evidence suggests breastfeeding and bonding are reciprocal behaviours (Else-Quest, Hyde, & Clark, 2003); given the associations established by the PSAS thus far, it would now be interesting to consider whether postpartum-specific anxiety moderates the relationship between them. In combination, these findings provide a foundational evidence-base warranting further investigation. Replication of these findings across diverse samples may in turn inform interventions aimed at reducing postpartum-specific anxiety and associated negative outcomes for mother and infant.

#### **Disclosure statement**

No potential conflict of interest was reported by the authors.

#### Funding

The authors have no financial relationships relevant to this article to disclose.

#### ORCID

Victoria Fallon (i) http://orcid.org/0000-0002-7350-2568

Sergio Alessandro Silverio D http://orcid.org/0000-0001-7177-3471 Kate Mary Bennett D http://orcid.org/0000-0003-3164-6894 Joanne Allison Harrold D http://orcid.org/0000-0002-0899-4586

#### References

- Beck, A. T., Steer, R. A., & Carbin, M. G. (1988). Psychometric properties of the beck depression inventory: Twenty-five years of evaluation. *Clinical Psychology Review*, 8(1), 77–100. doi:10.1016/ 0272-7358(88)90050-5
- Britton, J. R., Britton, H. L., & Gronwaldt, V. (2006). Breastfeeding, sensitivity, and attachment. *Pediatrics*, 118(5), e1436–e1443. doi:10.1542/peds.2005-2916
- Brockington, I. F., Macdonald, E., & Wainscott, G. (2006). Anxiety, obsessions and morbid preoccupations in pregnancy and the puerperium. *Archives of Women's Mental Health*, *9*(5), 253–263. doi:10.1007/s00737-006-0134-z
- Brodey, B. B., Goodman, S. H., Baldasaro, R. E., Brooks-DeWeese, A., Wilson, M. E., Brodey, I. S. B., & Doyle, N. M. (2016). Development of the Perinatal Depression Inventory (PDI)-14 using item response theory: A comparison of the BDI-II, EPDS, PDI, and PHQ-9. Archives of Women's Mental Health, 19(2), 307–316. doi:10.1007/s00737-015-0553-9
- Bussel, J. C. H. V., & Spitz, B. (2010). Three self-report questionnaires of the early mother-to-infant bond: Reliability and validity of the Dutch version of the MPAS, PBQ and MIBS. Archives of Women's Mental Health, 13(5), 373–384. doi:10.1007/s00737-009-0140-z
- Davis, E. P., & Sandman, C. A. (2010). The timing of prenatal exposure to maternal cortisol and psychosocial stress is associated with human infant cognitive development. *Child Development*, *81*(1), 131–148. doi:10.1111/j.1467-8624.2009.01385.x
- Dennis, C. L., Falah-Hassani, K., Brown, H. K., & Vigod, S. N. (2016). Identifying women at risk for postpartum anxiety: A prospective population-based study. *Acta Psychiatrica Scandinavica*, 134 (6), 485–493. doi:10.1111/acps.12648
- Dunkel Schetter, C. (2011). Psychological science on pregnancy: Stress processes, biopsychosocial models, and emerging research issues. *Annual Review of Psychology*, 62(1), 531–558. doi:10.1146/ annurev.psych.031809.130727
- Duran, S. (2019). Postpartum Specific Anxiety Scale (PSAS): Reliability and validity of the Turkish version. *Perspectives in Psychiatric Care*, 1–7. doi:10.1111/ppc.12385.
- Edhborg, M., Nasreen, H.-E, & Kabir, Z. N. (2011). Impact of postpartum depressive and anxiety symptoms on mothers' emotional tie to their infants 2–3 months postpartum: A population-based study from rural Bangladesh. *Archives of Women's Mental Health*, *14*(4), 307–316. doi:10.1007/s00737-011-0221-7
- Else-Quest, N. M., Hyde, J. S., & Clark, R. (2003). Breastfeeding, bonding, and the mother-infant relationship. *Merrill-Palmer Quarterly*, 49(4), 495–517. doi:10.1353/mpq.2003.0020
- Fairlee, T., Gillman, M. W., & Rich-Edwards, J. (2009). High pregnancy-related anxiety and prenatal depressive symptoms as predictors of intention to breastfeed and breastfeeding initiation. *Journal of Women's Health*, *18*(7), 945–953. doi:10.1089/jwh.2008.0998
- Fallon, V., Halford, J. C. G., Bennett, K. M., & Harrold, J. A. (2016). The postpartum specific anxiety scale: Development and preliminary validation. *Archives of Women's Mental Health*, *19*(6), 1079–1090. doi:10.1007/s00737-016-0658-9
- Fallon, V., Halford, J. C. G., Bennett, K. M., & Harrold, J. A. (2018). Postpartum-specific anxiety as a predictor of infant-feeding outcomes and perceptions of infant-feeding behaviours: New evidence for childbearing specific measures of mood. *Archives of Women's Mental Health*, 21(2), 181–191. doi:10.1007/s00737-017-0775-0
- Fallon, V., Komninou, S., Harrold, J. A., Bennett, K., & Halford, J. C. G. (2017). The emotional and practical experiences of formula feeding mothers. *Maternal and Child Nutrition*, 13(4) 1–14. doi:10.1111/mcn.12392
- Feldman, R., Granat, A., Pariente, C., Kanety, H., Kuint, J., & Gilboa-Schechtman, E. (2009). Maternal depression and anxiety across the postpartum year and infant social engagement, fear

regulation, and stress reactivity. *Journal of the American Academy of Child and Adolescent Psychiatry*, *48*(9), 919–927. doi:10.1097/CHI.0b013e3181b21651

- Guardino, C. M., & Schetter, C. D. (2014). Understanding pregnancy anxiety: Concepts, correlates and consequences. *Zero to Three*, 34(4), 12–21.
- Highet, N., Stevenson, A. L., Purtell, C., & Coo, S. (2014). Qualitative insights into women's personal experiences of perinatal depression and anxiety. *Women and Birth*, *27*(3), 179–184. doi:10.1016/j. wombi.2014.05.003
- Huizink, A. C., Robles De Medina, P. G., Mulder, E. J. H., Visser, G. H. A., & Buitelaar, J. K. (2002). Psychological measures of prenatal stress as predictors of infant temperament. *Journal of the American Academy of Child & Adolescent Psychiatry*, 41(9), 1078–1085. doi:10.1097/00004583-200209000-00008
- Hurley, K. M., Black, M. M., Papas, M. A., & Caulfield, L. E. (2008). Maternal symptoms of stress, depression, and anxiety are related to nonresponsive feeding styles in a statewide sample of WIC participants. *The Journal of Nutrition*, *138*(4), 799–805. doi:10.1093/jn/138.4.799
- Manian, N., Schmidt, E., Bornstein, M. H., & Martinez, P. (2013). Factor structure and clinical utility of BDI-II factor scores in postpartum women. *Journal of Affective Disorders*, 149(1–3), 259–268. doi:10.1016/j.jad.2013.01.039
- Meades, R., & Ayers, S. (2011). Anxiety measures validated in perinatal populations: A systematic review. *Journal of Affective Disorders*, 133(1–2), 1–15. doi:10.1016/j.jad.2010.10.009
- Nicol-Harper, R., Harvey, A. G., & Stein, A. (2007). Interactions between mothers and infants: Impact of maternal anxiety. *Infant Behavior and Development*, *30*(1), 161–167. doi:10.1016/j. infbeh.2006.08.005
- O'Higgins, M., St. James-Roberts, I., Glover, V., & Taylor, A. (2013). Mother-child bonding at 1 year; associations with symptoms of postnatal depression and bonding in the first few weeks. *Archives of Women's Mental Health*, *16*(5), 381–389. doi:10.1007/s00737-013-0354-y
- Pereira, A. T., Bos, S., Marques, M., Maia, B., Soares, M. J., Valente, J., Nogueira, V., Pinto de Azevedo, M. H., & Macedo, A. (2013). Short forms of the postpartum depression screening scale: As accurate as the original form. *Archives of Women's Mental Health*, *16*(1), 67–77. doi:10.1007/s00737-012-0319-6
- Phillips, J., Sharpe, L., & Matthey, S. (2007). Rates of depressive and anxiety disorders in a residential mother–infant unit for unsettled infants. *Australian and New Zealand Journal of Psychiatry*, 41(10), 836–842. doi:10.1080/00048670701579108
- Phillips, J., Sharpe, L., Matthey, S., & Charles, M. (2009). Maternally focused worry. Archives of Women's Mental Health, 12(6), 409–418. doi:10.1007/s00737-009-0091-4
- Schmoeger, M., Deckert, M., Wagner, P., Sirsch, U., & Willinger, U. (2018). Maternal bonding behavior, adult intimate relationship, and quality of life. *Neuropsychiatrie*, *32*(1), 26–32. doi:10.1007/s40211-017-0258-6
- Shin, H., Park, Y. J., & Mi, J. K. (2006). Predictors of maternal sensitivity during the early postpartum period. *Journal of Advanced Nursing*, *55*(4), 425–434. doi:10.1111/j.1365-2648.2006.03943.x
- Spielberger, C., Gorsuch, R., & Lushene, R. (1970). *Manual for the state-trait anxiety inventory*. Palo Alto, CA: Consulting Psychologists Press.
- Tietz, A., Zietlow, A. L., & Reck, C. (2014). Maternal bonding in mothers with postpartum anxiety disorder: The crucial role of subclinical depressive symptoms and maternal avoidance behaviour. *Archives of Women's Mental Health*, *17*(5), 443–442. doi:10.1007/s00737-014-0423-x