Are Breastfeeding Outcomes Predicted by Prenatal Mental Health, Maternal Orientation and Postnatal Affective Attitude Toward the Infant?

Ruth Picucci

Supervised by

Dr Helen Sharp and Prof Pauline Slade

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There are a host of well-established stable maternal socio-demographic factors associated with breastfeeding in Westernised countries (Dennis, 2002) however these may not be readily modifiable in the perinatal period. Therefore, focus has turned to identifying factors which may be modified through intervention. This thesis focuses on the evaluation of candidate psychological factors which might predict breastfeeding and therefore might be influenced during the perinatal period by clinical interventions in the future.

The current investigation adopts a quantitative methodology to this end, building on

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Introductory Chapter: Thesis Overview

Breastfeeding has been linked to health benefits for mothers and infants (Kramer & Kakuma, 2012); current World Health Organisation recommendations are for infants to be exclusively breastfed for the first six months of life (WHO, 2002). The low rate of breastfeeding in the UK has been identified as an important public health issue (Department of Health, 2002), with only 1% of infants breastfed as recommended (McAndrew et al., 2012).

There are a host of well-established stable maternal socio-demographic factors associated with breastfeeding in Westernised countries (Dennis, 2002) however these may not be readily modifiable in the perinatal period. Therefore, focus has turned to identifying factors which may be modified through intervention. This thesis focuses on the evaluation of candidate psychological factors which might predict breastfeeding and therefore might be influenced during the perinatal period by clinical interventions in the future.

The current investigation adopts a quantitative methodology to this end, building on biopsychosocial research which has identified an association between women's mental health, prenatal intentions, expectations of motherhood and breastfeeding. Additionally, the thesis includes a novel examination of women's early expression of warmth or criticism towards her infant and evaluates whether this significantly contributes to early breastfeeding cessation. This hypothesis builds on evidence of an association between affective attitudes and parenting practices in older children.

The Research Context

Research into the relationship between psychological processes and breastfeeding has predominantly focussed on the role of maternal mental health and social-cognitive psychological concepts. Investigations into the relationship between maternal mental health and breastfeeding include bio-medical research which has identified interactive and bi-directional relationships between neuroendocrine mechanisms implicated in breastfeeding physiology, such as oxytocin, and

psychological factors such as maternal depression and anxiety (e.g. Jonas et al., 2013). However, there is evidence suggesting that other factors are implicated in this possible relationship. For example, prenatal depression has been found to associate with reduced intention to breastfeed (Fairlie, Gillman & Rich-Edwards, 2009) and the lower likelihood of women initiating [ever putting the infant to the breast] (Deave, Heron, Evans & Emond, 2008), which does not relate to the biological processes of lactation.

To explain the possible link between maternal depressive symptomology and breastfeeding, studies have suggested low mood, negative cognitions and lower self-confidence contribute to the reduced intention and difficulties sustaining breastfeeding (Hahn-Holbrook, Haselton, Dunkel Schetter & Glynn, 2013; Henderson, Evans, Straton, Priest & Hagan, 2003; Insaf et al., 2011). Thus women do not believe they will be able to breastfeed successfully and are subsequently less motivated to attempt it; if they start they are more likely to perceive early difficulties as unsurmountable and may see such difficulties as more serious. Similar mechanisms have been proposed for maternal anxiety as women may anticipate not being able to cope with the demands of breastfeeding (Britton, 2007) and have lower self-efficacy in the face of breastfeeding difficulties (Adedinsewo et al., 2014).

Finally, maternal depression has been linked to the reduced responsivity of mothers to their infants (Papousek & Papousek, 1997). In the context of breastfeeding, mothers' may have greater difficulty interpreting their infants' feeding cues (Henderson et al., 2003), and pay greater attention to difficult infant behaviours which may impact on the breastfeeding interaction (Hahn-Holbrook et al., 2013). Therefore, there are possible cognitive and relational mechanisms proposed to underlie any predictive association between maternal mental health and breastfeeding which psychological interventions may be effective in ameliorating. However, this presupposes a clear link has been found between mental health and breastfeeding.

Much research assessing the impact of social-cognitive factors upon breastfeeding has been influenced by the Theory of Planned Behaviour (TPB; Ajzen, 1991). Studies assessing the TPB and breastfeeding have examined the direct influence of attitudes, norms, perceived behavioural control

and intention (e.g., Lawton, Ashley, Dawson, Waiblinger & Conner, 2012); the most consistent finding is of the importance of intention. Furthermore, studies of breastfeeding intention have found that, consistent with this model, intention is predicted by attitudes, norms and perceived behavioural control (McMillan et al., 2008; Bai, Middlestadt, Peng & Fly, 2010). It may be that psychologically informed interventions could be devised to modify intentionality to enhance the likelihood of breastfeeding behaviour.

In a strand of practice-based evidence from perinatal psychotherapy, Raphael-Leff's model of mothering orientation (1985, 2005) defines approaches to motherhood underpinned by a continuum of beliefs ranging from ''mother adapting to baby'' to ''baby adapting to mother'', and further formulates links to infant-feeding styles. The model has gained some empirical support for maternal orientations corresponding with hypothesised infant-feeding intentions (Sharp & Bramwell, 2004) and postnatal practices (Roncolato, McMahon & Grant, 2014), however there has not been an investigation undertaken looking at the relationship with breastfeeding across the whole perinatal period.

Finally, mothers' expressed feelings towards their child, have been hypothesised to indicate underlying relational schemas (Bullock & Dishion, 2007) and have been widely investigated in relation to parenting practices in older children (e.g. Waller, Gardner, Dishion, Shaw & Wilson, 2012). However, this association has not yet been explored in early infancy. This thesis seeks to evaluate the role of mother's affective attitude towards their infant in relation to the intimate, dynamic behaviour of breastfeeding. It is theorised that women expressing low levels of warmth or ambivalent feelings towards their infant postnatally, may find the relational process of breastfeeding more challenging to maintain and therefore such expressed attitudes may be associated with early cessation.

The Literature Review

The literature review attempts to evaluate current knowledge concerning the role of psychological factors in the prediction of breastfeeding outcomes. The focus is confined to the most recent prospective research conducted, with parameters to reduce the heterogeneity of studies;

consideration is given to individual study quality. The gaps in knowledge are especially evident from this review as the predictors of different breastfeeding behaviours are clearly delineated.

The literature review identifies many studies seeking to clarify associations between maternal mental health and social-cognitive factors with breastfeeding outcomes and limited prospective exploration of wider psychosocial factors. In contrast to previous reviews, findings of a predictive relationship between maternal mental health and breastfeeding behaviours were found to be inconsistent. Social-cognitive factors were found to be strongly predictive of breastfeeding outcomes however these were commonly measured postnatally. Furthermore, due to the small number of studies investigating wider psychosocial factors, the need for quantitative investigation of broader constructs was identified.

The Empirical Paper

The empirical paper aims to investigate the predictive role of two of the most influential psychological constructs within breastfeeding research, namely maternal mental health and intention, in the prediction of breastfeeding initiation and continuation at six weeks of age. Improving on previous research it assesses depressive and anxiety symptoms prenatally and explores the predictors and stability of prenatal intentions from the second to third trimester of pregnancy. The investigation extends what is known in the field by examining antenatal maternal orientation as a predictor of all breastfeeding outcomes and evaluates the role of postnatal affective attitude towards the infant in relation to continuation or cessation of breastfeeding at six weeks of age.

A secondary data analysis is utilised to pursue these aims due to the necessity for a longitudinal design to examine the predictors of breastfeeding outcomes and the importance of an adequate sample size to explore the relationships between variables whilst controlling for important maternal factors known to be associated with infant-feeding outcomes. Multivariate analyses are conducted to assess the independent and joint contribution of prenatal mental health, maternal orientation, intention, and affective attitude to breastfeeding outcomes.

Author's Role

To contribute original data in the form of coding five minute speech samples (FMSSs), the author completed training and submitted 25 test ratings to ensure inter-rater reliability on the affective attitude coding scheme. The 267 recorded FMSSs for use in this thesis were transcribed within the parent study. The author trialled the application of the coding scheme with another rater, and contributed to the development of adaptations for use with the novel population (mothers of new-born infants). The author coded a reliability set of 40 FMSSs from the current sample, completing the inter-rater reliability analysis, and coded the remainder of the 267 FMSSs with consensus meetings undertaken with the other rater to examine 11 FMSSs. The author entered the ratings into SPSS, cleaning the data before submitting to the parent dataset.

The NHS ethical approval, consent procedures and gathering of raw data was completed by the parent study and barring the FMSS ratings, all further data had been entered into a database. The author undertook all statistical analyses independently, except a transformation in STATA which was completed by a researcher from the parent study.

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Chapter 1: Psychological Predictors of Breastfeeding Outcomes: Narrative Review[1]

Abstract

Objectives

To identify prospective psychological factors that predict breastfeeding initiation, duration, early cessation, and level of exclusivity in perinatal women living in industrialised countries. Modifiable psychological factors present a possible focus for intervention by health professionals to improve breastfeeding rates.

Design

A narrative review of prospective, non-intervention empirical studies which examine psychological predictors of breastfeeding outcomes.

Data Sources

Electronic searches for breastfeeding and relevant psychological terms indexed in PsycINFO, CINAHL plus and MEDLINE were undertaken to identify empirical studies with women recruited following the publication of the current international infant feeding strategy in 2003 with prospective measurement of psychological predictors of breastfeeding outcomes.

Methods

Twenty studies were identified and quality assessed. Findings relating to maternal mental health, social-cognitive factors, perceived support and psychosocial characteristics were reported for exclusive and non-exclusive breastfeeding initiation, early cessation and duration.

Results

Prenatal depression was not found to be related to breastfeeding initiation; there were equivocal findings of an association between prospective depressive and anxiety symptoms and breastfeeding cessation and duration. Social-cognitive factors such as greater intentionality towards breastfeeding were predictive of breastfeeding initiation and length of breastfeeding, however, postnatal breastfeeding self-efficacy had the most enduring influence over time. There were few studies which

measured perceived support, with no evidence of an association with breastfeeding outcomes after controlling for confounders. There were limited numbers of studies which assessed an assortment of psychosocial factors, with mixed findings relating to the importance of relational, trait and attentional factors.

Conclusions

When focusing upon prospective research, findings of maternal mental health predicting breastfeeding outcomes are equivocal. However, postnatal social-cognitive factors appear to be robustly associated with breastfeeding outcomes. There is a paucity of prospective research exploring wider psychological constructs. Due to the importance of breastfeeding in conferring health benefits for infants, the review identified the necessity for further examination of the prospective associations between modifiable psychological factors and breastfeeding outcomes.

Introduction

Breastfeeding is associated with a broad range of nutritional and non-nutritive health benefits for infants such as enhancement of the immune system and protection against illness (Heinig & Dewey, 1996). Such benefits have led the World Health Organisation to recommend that infants are exclusively breastfed for the first six months of life (WHO, 2002). Their Global Strategy for Infant and Young Child Feeding (WHO, 2003) provides a 'guide for action' (p. vi) for governments and international organisations to develop policies and guidelines to support breastfeeding. However breastfeeding rates remain low worldwide, with only 36% of infants' breastfed exclusively to six months (UNICEF, 2011). In the UK, 81% of infants are breastfed at some point, but only 1% of infants are breastfed exclusively to six months of life (McAndrew et al., 2012).

This report first seeks to give readers a brief overview of the maternal, infant, perinatal and contextual factors associated with breastfeeding behaviour in review articles or meta-analyses of the literature to date, followed by a brief summary of some of the methodological issues that limit conclusions being drawn across studies. The results of a new focussed narrative review are then

presented, summarising psychological factors found to be *prospectively* associated with breastfeeding outcomes in industrialised countries following WHO's Global Strategy in 2003. The focus on psychological predictors provides a possible focus for intervention by health professionals to induce changes in women's breastfeeding behaviours. Identification of such factors may also point towards screening for appropriate risk and protective factors to enable the targeting of interventions, thereby maximising the efficiency of finite resource allocation.

Brief Overview

In developed countries, the maternal socio-demographic factors found to be most consistently associated with breastfeeding are maternal age, education, marital and socioeconomic status; with older, married women, with higher income, education and occupational status being more likely to initiate and maintain breastfeeding (Dennis, 2002; Meedya, Fahy & Kable, 2010). In developing countries, by contrast, an inverse relationship with socio-economic factors has been reported (Dennis, 2002). Reviews of the literature have further highlighted the importance of maternal factors such as smoking, which has been cited as having a dose-response relationship with negative breastfeeding outcomes (Dennis, 2002). Additionally, maternal obesity, ethnicity, immigration status, plans to return to work, parity and prior breastfeeding experience have been identified as having an association though with some equivocal findings (Dennis, 2002; Thulier & Mercer, 2009).

Infant and perinatal factors such as lower gestational age (Dennis, 2002), neonatal hospital admission and early breastfeeding difficulties (Thulier & Mercer, 2009) have been linked to poorer breastfeeding outcomes. However findings on the relationship between obstetric experiences, such as childbirth method, and breastfeeding have been mixed. Healthcare practices which promote demand feeding have been positively associated with breastfeeding duration and early supplementation with infant formula negatively so (Dennis, 2002).

The exploration of psychological factors has predominantly focused upon the role of maternal mental health, with a vast body of research investigating the links between maternal depression and breastfeeding. In their meta-analysis, Grigoriadis et al. (2013) reported an overall association between raised antenatal depressive symptomology and lower likelihood of breastfeeding initiation; however,

another review reported no relationship (Dias & Figueiredo, 2015). Antenatal and postnatal depressive symptomology has also been associated with the reduced length of breastfeeding (Dias & Figueiredo, 2015; Dennis & McQueen, 2009) and exclusive breastfeeding (de Jager et al., 2012). The influence of anxiety symptoms has also been reviewed, with limited support for an association with reduced duration of exclusive breastfeeding (Fallon, Bennett & Harrold, 2015; de Jager et al., 2012) and no evidence of a link with the initiation or the duration of *any* breastfeeding (Fallon et al., 2015).

Numerous reviews have reported a strong relationship between reported intention to breastfeed and subsequent breastfeeding behaviour. Earlier timing of decision, stronger intention and longer intended duration have each been shown to be positively associated with initiation and duration (Dennis, 2002; de Jager et al. 2012). Furthermore, positive beliefs and attitudes about breastfeeding, maternal confidence and breastfeeding self-efficacy have been associated with greater length of breastfeeding (Thulier & Mercer, 2009; de Jager et al., 2012). Exposure to others who have experience of breastfeeding has been positively associated with initiation and duration, particularly for low-income and adolescent mothers (Dennis, 2002; Meedya et al., 2010).

The findings on the perceived support of friends and family, or contrastingly relationship distress, are equivocal (de Jager et al., 2012; Thulier & Mercer, 2009). Dennis (2002) and Thulier and Mercer (2009) reported that professional support has the capacity to influence breastfeeding outcomes positively or negatively.

Methodological Issues

The reviews conducted to date identified weaknesses in the research methodologies adopted by studies, notably the use of retrospective or cross-sectional designs, which limits inferences about the direction of effects (Dennis & McQueen, 2009). This is of particular importance where bi-directional associations have been proposed, such as between depression and breastfeeding. The heterogeneity of studies reported in the reviews also may act to obscure predictive relationships which are population or context-specific. For example, in developing countries important contextual factors, like access to basic healthcare services may be dissimilar to or operate differently from those in

Westernised countries (Dennis, 2002). Furthermore, the socio-political context of women's perinatal healthcare has been reported to vary widely, depending on the current guidance around breastfeeding (de Jager et al. 2012); with significant changes in 'products, policies, information, and education' occurring in the decade following the early nineties (Fein et al., 2008, p. s28).

To the author's knowledge, a comprehensive review of psychological predictors of breastfeeding outcomes which minimises the heterogeneity of studies included, focuses on prospective research designs undertaken since the establishment of current international guidelines (WHO, 2003), and summarises findings within relatively homogenous socio-economic contexts, has not yet been undertaken. Yet, the results of such a review would (i) identify new foci for studies of possible psychological factors associated with improved breastfeeding outcomes and (ii) inform new psychological interventions to promote improved breastfeeding outcomes.

Aim

This narrative review aims to summarise the recent evidence base for psychological factors, occurring naturalistically in the perinatal period, that prospectively predict breastfeeding initiation, duration, early cessation, and level of exclusivity in industrialised countries.

Method

Data Sources

Several health databases (PsycINFO, Cumulative Index to Nursing and Allied Health Literature [CINAHL] plus, MEDLINE) were searched for the terms: Breastfe* OR Breast*fe* AND Psycho* OR mood OR depress* OR anx* OR cogniti* OR attachment AND Initiat* OR cessation OR duration OR maint* OR exclusiv*. A limiter of English Language, date 2003 to present was conducted on the 13th of September 2015. Studies where the abstract was available in English although the full paper was in another language were latterly excluded as the methodology of the research could not be adequately scrutinised.

Study Selection

Database searches and study selection was undertaken by the author RP (doctoral student). The search resulted in 1092 hits, removal of 338 duplicate articles left 754 articles to which inclusion criteria were applied (see Figure 1). Empirical, peer reviewed, non-intervention, prospective studies, with recruitment commencing from 2003 onwards, in industrialised countries, as defined by UNICEF (2011), were included which reported on psychological predictors of breastfeeding initiation, duration, early cessation or exclusivity. By limiting the review to include women recruited from 2003, the variability of post-delivery factors such as hospital infant feeding policies and midwifery support was minimized.

Studies of subgroups of women such as low-income or particular ethnic groups were included. However, special groups defined by obstetric status were excluded (e.g., studies reporting on preterm infants or mothers with diabetes) since aspects of physical health may confound the examination of psychological variables. The reported analyses of prospective psychological variables, defined as those which were measured prior to the occurrence of breastfeeding outcomes across the sample, were included. Articles were removed based on the first identifiable exclusion criteria. Where the dates of recruitment were not reported in the text, corresponding authors were emailed and asked to confirm this; of the fourteen contacted, two studies were excluded due to non-response.

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│    MEDLINE 321      │
│   psycINFO 370      │
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Reasons for exclusion:

Not empirical	102
Not psychological predictor of breastfeeding	383
Not English	1
Not prospective	53
Not industrialised country	60
Recruitment prior to 2003	50
Intervention study	56
Special obstetric group	29

Figure1. Search strategy flow diagram

Quality Assessment

Twenty studies were quality assessed independently by RP and another doctoral student, using the Systematic Assessment of Quality in Observational Research (SAQOR; Ross et al., 2011). The SAQOR was developed to quality assess studies in perinatal psychiatry, as there is a lack of standardised tools which are suitable for this purpose (Ross et al., 2011). Studies were scored as ''adequate'', ''inadequate'', ''unclear'' or ''N/A'' within the domains of sample, use of a control/comparison group, exposure/outcome measurement, follow-up, distorting influences and reporting of data. Adequacy within each domain was calculated by the presence of a number of quality indicators (see Appendix 2). The total number of adequate domain ratings (range 0-6) indicated an overall ''quality of evidence'' rating. The overall rating has a possible range of ''high'', ''moderate'', ''low'' or ''very low'' quality; allocated ratings ranged from moderate to very low. The

tool was minimally adapted for use in breastfeeding research with maternal and infant/perinatal factors identified as key potential confounders. Differences between assessor ratings were agreed by discussion and consensus.

Results

The review identified 20 studies, with samples from the USA (7), Australia (5), Canada (4), UK (3) and Portugal (1). Both exclusive and non-exclusive breastfeeding findings were grouped according to outcomes of ''initiation'', whether women started breastfeeding or not, and two separate length of breastfeeding outcomes. Clear differentiation was made between studies which isolated women who initiated and ceased – ''early cessation'' and those who measured the duration of breastfeeding but included women who never breastfed – ''duration'' (see Table 1). Table 1 briefly describes the study design, sample, prospective psychological factors, how breastfeeding outcomes were measured and any confounding factors included in final analyses. Lastly, the main findings relating to psychological predictors are outlined with the SAQOR rating and brief methodological comments. Four studies reported both initiation and duration findings; these studies are duplicated in Table 1 however only the descriptors relevant to the initiation/duration findings are recorded in the appropriate sections.

In the narrative summary that follows, please refer to Table 1 for specification of the confounding factors addressed by the individual studies. Findings were structured according to four psychological categories, namely maternal mental health, social-cognitive factors, perceived support and psychosocial characteristics. Social-cognitive elements include those which explicitly or implicitly relate to models such as the Theory of Planned Behaviour (Ajzen, 1991) and Social Cognitive Theory (Bandura, 1986).

Table 1

Summary table of included studies

Breastfeeding initiation

Study	Design	Sample [a]	Prospective psychological factors	Breastfeeding outcome measure [b]	Confounding factors within analyses [c]	Main prospective psychological predictor findings	SAQOR rating & comments
Bogen, Hanusa, Moses-Kolko & Wisner (2010)	Prospective longitudinal study; USA	Convenience sample of 127 women recruited prenatally in 2004-07 without intention to only formula feed	*Major depressive disorder* (clinician administered SCID/follow-up), *Depressive symptom severity* (HDRS ≥ 9), Infant feeding: *Intention* (breast only/mixed/unsure), *Determination, Certainty & Confidence* (binary), measured prenatally (20, 32 & 36 wks)	Initiation (ever tried to breastfeed) measured at 2 wks postpartum (PP)	None	Women with prenatal intention and determination to breastfeed were more likely to initiate. Major depressive disorder and symptom severity were not associated with initiation. Certainty of choice and confidence in ability not reported	**Moderate Quality** Clinician measured depression; targeted recruitment from mental health clinics
Figueiredo, Canario & Field (2014)	Prospective cohort study; Portugal	Community sample of 145 women recruited prenatally in 2007-08	*Depression* (EPDS, Portuguese version, mean score), measured during each trimester	Initiation of exclusive breastfeeding (Labbok & Krasovec, 1990) measured at birth	None	Women's antenatal depressive symptoms were not associated with initiation of exclusive breastfeeding	**Low Quality** Parameters of *exclusive* initiation not clearly defined; non-initiation group (n=12)
Lawton, Ashley, Dawson, Warblinger & Conner (2012)	Prospective cohort; UK	184 women recruited prenatally from cohort study 2008-2009. Grouped by ethnicity	*Extended Theory of Planned Behaviour* questionnaire of breastfeeding (continuous): Intention, Self-efficacy, Perceived control, Affective & Instrumental attitude, Injunctive, Descriptive & Moral norm, measured prenatally	Initiation (breastfed their infant at birth) measured at 6 ms PP	Maternal age, education, parity, deprivation, ethnicity	Multivariate analysis only: Women with greater intention to breastfeed and a more positive affective attitude towards breastfeeding were more likely to initiate. Other psychological factors were not associated with initiation	**Low Quality** Broad definition of initiation

Study	Design	Sample [a]	Prospective psychological factors	Breastfeeding outcome measure [b]	Confounding factors within analyses [c]	Main prospective psychological predictor findings	SAQOR rating & comment
Mathews, Leerkes, Lovelady & Labban (2014)	Prospective longitudinal study; USA	237 primiparas in a nutrition program recruited from a larger study in 2009-2011	*Depression* (CES-D scale, continuous) *Adult attachment security* (AAI, coherence of report, continuous) *Maternal beliefs about infant crying* (ICQ), measured in the third trimester	Initiation (infant ever breastfed) measured at 6 ms PP	Maternal age, education, income, partner status, ethnicity	Bivariate analyses: Women with lower beliefs that crying should be controlled & greater attachment coherence scores were more likely to initiate breastfeeding. Depressive symptoms not significantly associated. Multivariate analysis of attachment: Women with higher attachment coherence scores remained more likely to initiate breastfeeding	**Moderate Quality** AAI 'gold standard' for attachment research; power unreported

Breastfeeding continuation or early cessation (following initiation)

Study	Design	Sample [a]	Prospective psychological factors	Breastfeeding outcome measure [b]	Confounding factors within analyses [c]	Main prospective psychological predictor findings	SAQOR rating & comment
Bai, Middlestadt, Peng & Fly (2010)	Prospective cohort study; USA	Community sample of 78 women, who were exclusively breastfeeding, recruited in 2006, up to 3ms PP	*Theory of Planned Behaviour* questionnaire on exclusive breastfeeding: Intention to continue to 6 ms, Perceived behavioural control measured up to 3 ms PP	Continuation of exclusive breastfeeding (human milk with no supplementation of any type [American Academy of Pediatrics]) at 6 ms PP	Marital status, maternal age, education, participation in a nutrition program (SES indicator)	Bivariate and multivariate analyses: Women's postnatal intention predicted continuation to 6ms. Perceived behavioural control was not associated with continuation	**Low Quality** Timing of predictor measurement varied; sample homogeneity (white, highly educated)
Craig et al., (2015)	Prospective, longitudinal birth cohort study; Australia	100 breastfeeding mothers of aboriginal infants, recruited from a maternity ward in 2005-2007	*Intention* to breastfeed (dichotomous), *Depression* (EPDS ≥10) measured post-delivery	Continuation of breastfeeding (Australian National Breastfeeding Strategy definitions, 2009) measured at 2-3 wks PP	None	Women's post-delivery depression and intention to breastfeed were not associated with continuation of breastfeeding	**Low Quality** Intention measured PP

McCarter-Spaulding & Gore (2009)	Longitudinal cohort study; USA	155 breastfeeding women of African descent, recruited in 2006 from hospital post-delivery	*Intentionality*: Planned pattern and duration of breastfeeding, *Breastfeeding self-efficacy* (BSES - SF mean), measured at an average of 2 days PP	Level of breastfeeding (high, partial, or token breastfeeding/weaned [Labbok & Krasovec, 1990]) in last 24 hrs measured monthly up to 6 ms PP/cessation	Sociodemographic and/or feeding variables (specific variables not reported)	Women with higher breastfeeding self-efficacy were more likely continue breastfeeding at 1 & 6 ms and to breastfeed more exclusively at 1m PP. Women's planned level of breastfeeding predicted level of breastfeeding at 1 m but not 6 ms PP. Planned duration of breastfeeding was not associated with continuation	**Very Low Quality** Statistical results unclear and confidence intervals unreported
McQueen, Sieswerda, Montelpare & Dennis (2015)	Prospective cohort; Canada	130 breastfeeding aboriginal women recruited from hospital PP in 2010-2011	Ordinal measurement of: *Intentionality*: Planned duration, Plan to exclusively breastfeed, *Belief* whether they would meet breastfeeding goal, *Breastfeeding self-efficacy* (BSES-SF), measured prior to hospital discharge	Level of breastfeeding (exclusive, any or formula only[Labbok & Krasovec, 1990]) for past week) measured at 4 wks & 8 wks PP	None	Women with a planned duration of breastfeeding, who planned to exclusively breastfeed, felt they would meet their planned duration goal & had higher breastfeeding self-efficacy were more likely to continue breastfeeding and at a greater level at 8 wks PP	**Low Quality** Confounders not included in analysis
O'Brien & Fallon (2005)	Longitudinal survey design; Australia	147 breastfeeding women, recruited from hospital in 2003, 3 days PP	*Intentionality*: Time of infant-feeding decision, Planned duration, Intention to demand feed (binary), *Breastfeeding Self-efficacy* (BSES-SF continuous), measured at 3 days PP	Current level of breastfeeding (exclusive [breastmilk only], partial or no human milk) and continuation to 6 wks PP	Parity, significant others' feeding preferences	Bivariate analyses: Women with lower planned duration of breastfeeding were more likely to cease plus multivariate findings. Intention to demand feed not associated. Multivariate analysis: Women with lower breastfeeding self-efficacy and those who made their infant feeding decision after pregnancy were more likely to cease exclusive breastfeeding	**Low Quality** High participation rate, study power unreported

O'Brien, Buikstra & Hegney (2008)	Prospective, survey-based design; Australia	375 breastfeeding women recruited in 2005 from maternity wards PP	*Traits*: Dispositional optimism (LOT-R), Achievement striving (Adapted AS Scale), Adaptability (IPIP), Psychological reactance (HPRS-refined), *Mental health:* Anxiety, Depression & Stress (DASS-21), Self-esteem (RSES), *Mother's current priorities* (novel), *Beliefs*: Faith in breastmilk (novel), Breastfeeding expectations (novel), *Intentionality*: Timing of infant feeding decision, Planned duration, *Self-efficacy:* Mothering (PSOC subscale) Breastfeeding (BSES – SF). All measured average 3.5 days PP	Current level of breastfeeding: Fully (without milk-substitutes) vs. not-fully breastfeeding. Any breastfeeding vs. no breastfeeding (Webb et al., 2001) and cessation measured at 6m PP	Maternal education, age, occupation, previous breastfeeding experience, partner's infant-feeding preference	Bivariate analyses: Women with greater dispositional optimism, breastfeeding self-efficacy, and faith in breastmilk; lower expectations of breastfeeding difficulty and anxiety; earlier timing of infant feeding decision and longer planned duration were more likely to breastfeed 'fully' and 'any' for longer. Multivariate analyses: Women with greater faith in breastmilk and a planned duration greater than 6ms (higher breastfeeding self-efficacy 'any' only) were more likely to continue fully or any breastfeeding at 6 ms. Other psychological factors were not associated with continuation	**Moderate Quality** Good breadth of confounders considered in analyses with a conservative alpha $p<.004$
Paul, Downs, Schaefer, Beiler & Weisman (2013)	Analysis of data from an RCT; USA	1123 breastfeeding women who reported planning to continue; recruited in 2006-09 from hospital	*Depression* (EPDS $\geq$ 12), *Anxiety* (STAI $\geq$ 40), before hospital discharge	Level and continuation of breastfeeding at 2wks, 2 ms and 6 ms PP	Stratification by parity and delivery method	Pre-stratification: Women with clinically significant anxiety symptoms were more likely to cease breastfeeding before 6 ms PP. Post-stratification: Anxiety only predicted cessation for primipara women and those who delivered vaginally. Depressive symptoms predicted cessation before 6 ms for primipara women and those delivering operatively	**Low Quality** Unclear how breastfeeding defined. Limited consideration of confounding influences

| Quinlivan, Kua, Gibson, McPhee & Makrides (2015) | Secondary analysis of data from an RCT; Australia | 2148 breastfeeding women, recruited 2005-2008 | *Social support* (MSSI - continuous), *History of depression* (dichotomous), measured prenatally | Continuation of breastfeeding at 6 wks & 6 ms PP. Early cessation group (<6 ms) or breastfeeding group (≥6 ms) | Maternal age, education, smoking, preterm birth, birthweight, postnatal depression | Bivariate analyses: Women with a history of depression were more likely to cease breastfeeding by 6 months. Social support not associated. Multivariate analysis: Social support and history of depression were not associated with infant feeding group | **Low Quality** Unclear definition of depression history |

Breastfeeding duration (including women who did not initiate)

Study	Design	Sample a	Prospective psychological factors	Breastfeeding outcome measure b	Confounding factors within analyses c	Main prospective psychological predictor findings	SAQOR rating & comments
Adedinsewo et al. (2014)	Longitudinal cohort study; Canada	Community sample of 255 prenatal women recruited in 2004-09	*Anxiety* (HAM-A & STAI continuous), measured prenatally	Duration of breastfeeding: Exclusive (Infant's age when first received something other than breastmilk); Any (Infant's age when stopped breastfeeding), measured at 3, 6 & 12 ms PP	Pregnancy wanted, maternal age, education, partner status, parity, primary language, SES, infant gender, birth weight, gestational age	Bivariate analyses: Women with higher prenatal anxiety were less likely to exclusively breastfeed at 3 ms or breastfeed at all at 12 ms PP. No associations at 6 ms. Multivariate analyses: Prenatal anxiety was not associated with breastfeeding duration	**Low Quality** Stratified sampling for anxious, depressed & low-income women
Bailey, Clark & Shepherd (2008)	Longitudinal cohort study; UK	Community sample 57 prenatal women with breastfeeding intention recruited 2005-06	All continuous: *Self-esteem* (RSES), *Breastfeeding attitudes* (BAS - novel), *Self-efficacy*: General (GSES), Breastfeeding (BSES-SF), measured prenatally	Duration of predominant breastfeeding (may also receive other milk/liquids [WHO]) to 4ms PP	Maternal age	All analyses: Women with greater prenatal breastfeeding and general self-efficacy were more likely to breastfeed to 4ms PP. Self-esteem & breastfeeding attitudes were not associated with duration	**Low Quality** Study was substantially underpowered; targeted sampling of teenage mothers

Bogen et al. (2010)	Prospective longitudinal study; USA	Convenience sample of 127 women recruited prenatally in 2004-07 without intention to only formula feed	*Major depressive disorder* (clinician administered SCID/follow-up), *Depressive symptom severity* (HDRS ≥ 9) Infant feeding: *Intention* (breast only/mixed/unsure), *Determination, Certainty & Confidence* (binary), all measured prenatally (20, 32 & 36 wks) and at delivery (except HDRS)	Breastfeeding status: primarily breastfeeding (≥90% breastmilk) or partial (<90% breastmilk) ,or not breastfeeding) at 2 and 12 wks PP	Early level of breastfeeding, race, marital status, education, BMI, SRI medication use	Bivariate analyses: Women with prenatal intention to exclusively breastfeed and determination to breastfeed were more likely to be breastfeeding at 2 wks & 12 wks. Women with confidence in breastfeeding were more likely to be breastfeeding at 2 wks and those with certainty in their decision more likely to be breastfeeding at 12 wks PP. Multivariate analyses: Women with prenatal intention to exclusively breastfeed were more likely to primarily breastfeed at 2 wks and do any breastfeeding at 12 wks PP. There were no associations with depression diagnosis or symptoms	**Moderate Quality** 39% attrition at 12 wks and significant differences in participants lost to follow up
de Jager et al. (2015)	Longitudinal, prospective study; Australia	196 women recruited from antenatal clinics during 2011-2013	*Psychological adjustment* (DASS-21), *Attitude towards pregnancy* (ATPS- novel) *Body attitude* (BAQ), *Confidence, Motivation & Importance* of exclusive breastfeeding initiation & maintenance, *Intended* duration, *Breastfeeding self-efficacy* (BSES-SF), (all continuous), measured prenatally	Current exclusive breastfeeding (feeding nothing but breastmilk) at 2ms & 6ms PP	None	Psychosocial model: Women with higher prenatal confidence to maintain were more likely to breastfeed exclusively for longer. Other psychological factors were not associated with duration	**Low Quality** Sample homogeneity (highly educated); confounding variables not assessed

Dennis, Gagnon, Van Hulst & Dougherty (2014)	Longitudinal study; Canada	1184 women Canadian-born and migrant groups recruited in 2006-09 from hospital PP, who reported some breastfeeding at 16 wks	*Depression* (EPDS ≥ 10), *Social support* (PRQ mean), *Breastfeeding support from maternal mother, husband & peers* (binary), *Intentionality*: Planned feeding method & duration measured at 1 wk PP	Exclusive breastfeeding status (only breastmilk & water) from birth measured at 16 wks	Six migration factors, residency area, maternal age, income, education, smoking, cohabitation, infant hospital admission, breastfeeding pain, parity, delivery method, exclusive breastfeeding at 1 week	Migrant-group findings: Women who planned to exclusively breastfeed and made their infant feeding decision before pregnancy (bivariate only: had breastfeeding support from her mother and a planned duration of exclusive breastfeeding) were more likely to exclusively breastfeed to 16 wks. Canadian-born group findings: Women whose planned duration of exclusive breastfeeding was >6ms and did not have depressive symptomology (bivariate only: had breastfeeding support from the father and plans to exclusively breastfeed) were more likely to exclusively breastfeed to 16 wks	**Moderate Quality** Good breadth of confounders & large sample. Breastfeeding intentions measured PP
Figueiredo et al. (2014)	Prospective cohort study; Portugal	Community sample of 145 women recruited prenatally in 2007-08	*Depression* (EPDS, Portuguese version, mean score), measured during each trimester	Exclusive breastfeeding duration since birth (Labbok & Krasovec, 1990); measured at birth, 3, 6 & 12 ms PP	None	Women with higher first trimester depressive symptomology were less likely to exclusively breastfeed at 3 m; higher third trimester depressive symptomology associated with lower duration of exclusive breastfeeding to 12 ms. Second trimester depressive symptoms were not associated with duration	**Low Quality** Study reported sufficient power; did not assess confounders alongside mood

Lawton, et al. (2012)	Prospective cohort; UK	184 women recruited prenatally from cohort study 2008-2009. Grouped by ethnicity	*Extended Theory of Planned Behaviour* questionnaire of breastfeeding (continuous): Intention, Self-efficacy, Perceived control, Affective attitude, Instrumental attitude, Injunctive, Descriptive and Moral norm, measured during third trimester	Breastfeeding duration (whether currently breastfeeding their infant Y/N) measured at 6 ms PP	Maternal age, education, parity, deprivation, ethnicity	Multivariate analysis only: Women with more positive prenatal affective attitudes towards breastfeeding were more likely to breastfeed at 6 ms PP. Other Theory of Planned Behaviour factors were not associated with duration	**Low Quality** Attrition 22%, significant differences in those lost to follow up
Mathews et al. (2014)	Prospective longitudinal study; USA	237 primiparas in a nutrition program recruited from a larger study in 2009-2011	*Depression* (CES-D scale, continuous) *Adult attachment security* (AAI, coherence of report, continuous) *Maternal beliefs about infant crying* (ICQ), measured in the third trimester	Breastfeeding duration (were their infants ever breastfed and if so, for how long?) measured at 6 & 12 ms PP	Maternal age, education, income, BMI, partner status, ethnicity, employment status 6ms PP	Bivariate analyses: Women with higher depressive symptomology, lower attachment coherence, beliefs that crying should be controlled and that responding to crying promotes attachment, breastfed for a shorter duration. In multivariate analyses crying beliefs and attachment coherence were not associated with duration (depression used as covariate)	**Moderate Quality** Did not differentiate exclusivity of breastfeeding
Pearson, Lightman & Evans (2011)	Longitudinal study using an attentional task; UK	75 pregnant women under community midwives recruited in 2008	Attentional sensitivity to infant distress in late pregnancy (>34 weeks)	Breastfeeding or formula feeding at 3-6 ms PP	Postnatal mood, maternal age, social class, education, parity and infant age at time of follow-up	Prenatal attentional sensitivity to infant distress did not predict infant-feeding method	**Low Quality** Infant-feeding not operationalised; small sample size

Semenic, Loiselle & Gottlieb (2008)	Prospective study; Canada	189 breastfeeding primiparas; with intention to EBF ≥ 6 wks PP; recruited in 2003 from maternity wards 1-3 days PP	*Maternal infant feeding beliefs* (score reflects pro-breast/pro-formula), *Intended duration* exclusive and any breastfeeding, *Breastfeeding self-efficacy* (BSES-SF, continuous), *Social support* (PSQ, continuous), measured 1-3 days PP	Breastfeeding duration: Exclusive breastfeeding (includes use of formula supplementation <1 wk PP) vs. non-exclusive breastfeeding measured at 6 wks, 4 ms, 6ms	None	Women with greater breastfeeding self-efficacy exclusively breastfed for a longer duration. Other psychological factors were not associated	**Low Quality** Sample homogeneity (well-educated, affluent, non-smoking)
Spinelli, Endicott & Goetz (2013)	Secondary analysis of an RCT; USA	145 pregnant women who met criteria for Major depressive disorder, not currently taking antidepressants, recruited 2005-2011	*Depression* (multiple HDRS and EPDS scores aggregated to create two global clinical depression scores) during prenatal intervention	Any current breastfeeding at 4 wks PP	Socio-demographic variables (unspecified) but including ethnicity, immigration status & parity	There was no association between prenatal depressive symptomology and breastfeeding status at 4 wks PP	**Low Quality** Clinician rated depression. 28% attrition at 4 wks PP; each group received intensive intervention
Stuebe, Grewen & Meltzer-Brody (2013)	Longitudinal cohort study; USA	52 pregnant women with intention to breastfeed to ≥ 3 ms PP. Recruited in 2010-11 from perinatal obstetric & psychiatry clinics	*Lifetime psychiatric history*, *Prenatal depression/anxiety* (clinician administered SCID), Self-reported mood symptoms (STAI ≥ 34, EPDS ≥ 10) measured in third trimester	Level of breastfeeding (percentage of feeds breastmilk) and 'Any' breastfeeding (time until weaned from breastmilk) during the last week at 2 & 8 wks PP	None	No association was found between psychiatric or psychological measures of depression or anxiety and level or duration of breastfeeding.	**Low Quality** Exploratory research of lactogenic hormones & maternal mood. Underpowered

Note. Abbreviations: Adapted AS Scale - Adapted Achievement Striving Scale, ATPS - Attitude Towards Pregnancy Scale, BAQ - Body Attitude Questionnaire - short form, BAS - Breastfeeding Attitudes Scale, BMI - Body Mass Index, BSES-SF - Breastfeeding Self-Efficacy Scale - Short Form, DASS-21 Depression Anxiety Stress Scale-21, EPDS - Edinburgh Postnatal Depression Scale, GSES – General Self-Efficacy Scale, HAM-A - Hamilton Anxiety Scale, HDRS - Hamilton Depression Rating Scale, HPRS-refined - Hong's Psychological

Reactance Scale-refined, ICQ - Infant Crying Questionnaire, IPIP - International Personality Item Pool, LOT-R Life Orientation Test-Revised, MSSI - Maternal Social Support Index, PP - postpartum, PRQ - Personal Resources Questionnaire, PSOC - Parenting Sense of Competence Scale, PSQ - Postpartum Support Questionnaire, RSES - Rosenberg Self-Esteem Scale, SCID - Structured Clinical Interview for DSM IV Disorders, SES - socio-economic status, SRI - Serotonin reuptake inhibitor, STAI – State-Trait Anxiety Scale. [a] Samples were multiparous unless primiparous stated. [b] Breastfeeding definition and where stated, standardised classification reference. [c] Some studies did not include additional confounding factors in multivariate analyses if they were found to have non-significant bivariate associations with breastfeeding.

Initiation

Four studies assessed psychological predictors of breastfeeding initiation, most commonly defined as mothers' ''ever breastfeeding''. Initiation is qualitatively different from other breastfeeding behaviours as it precedes the influence of many postnatal experiences, such as breastfeeding difficulties, which may interact with the psychological predictors discussed.

Maternal mental health

Three studies, using screening questionnaires or clinician assessment, reported no relationship between antenatal depression and breastfeeding initiation (Bogen et al., 2010; Figueiredo et al., 2014; Mathews et al., 2014). The absence of an association may be due to limitations in statistical power, since women who did not initiate breastfeeding were not well-represented in each study.

Social-cognition

Two studies looked at the relationship between prenatal intentions to breastfeed and initiation, with each reporting strong associations (Bogen et al., 2010; Lawton et al., 2012). Lawton's revised Theory of Planned Behaviour measure of breastfeeding extended the model's components by distinguishing between affective and instrumental attitudes, injunctive, descriptive and moral norms, and self-efficacy and perceived control. Each factor was assessed for its direct association with behaviour. In a multivariate analysis including demographic factors (see Table 1), affective attitude (e.g., anticipation of enjoyment of breastfeeding) and intention significantly predicted initiation and acted as a mediator between ethnicity and breastfeeding.

Maternal psychosocial characteristics

In a moderate quality study, Mathews et al. (2014) measured maternal attachment security through prenatal administration of the Adult Attachment Interview, which seeks to identify adults' attachment relationships from their childhood (Bakermans-Kranenburg & van IJzendoorn, 1993) and beliefs about infant crying. In a multivariate analysis controlling for demographics and prenatal depression, higher attachment coherence, indicative of attachment security, was significantly associated with initiation. Of the five crying beliefs examined, only higher need to control infant crying was significantly associated with non-initiation of breastfeeding in the bivariate analysis undertaken.

Initiation summary

Prenatal depression was not found to be predictive of breastfeeding initiation; lower endorsement of control beliefs about infant crying was found to have a bivariate association with initiation. Whilst controlling for confounding variables, greater prenatal attachment security, intention to breastfeed, and positive affective attitude towards breastfeeding had a direct association with initiation; however instrumental attitude, perceived behavioural control and subjective norms were not associated with breastfeeding.

Early Cessation of Breastfeeding

Eight studies assessed whether psychological variables predict when women stop breastfeeding after they have initiated. Studies which assess continuation or early cessation of breastfeeding only include women who tried breastfeeding in the early postnatal period. Thus the psychological factors identified may be different from those which influence breastfeeding duration, which also include women who never started breastfeeding.

Maternal mental health

Four studies assessed mental health as a predictor of early cessation. Quinlivan et al. (2015) found that depression history predicted cessation prior to six months in a bivariate but not the

multivariate analysis controlling for socio-demographics, smoking, postnatal depression, social support and infant factors; however, in this low quality study, history of depression was poorly defined.

Three studies assessed maternal mental health post-delivery. In a low quality study, Paul et al. (2013) found that higher anxiety and depressive symptomology predicted early cessation of breastfeeding up to six months in primiparas only; however, there was no control for socio-demographic factors. In a moderate quality study, O'Brien et al. (2008) found that anxiety was the only mental health indicator to predict breastfeeding cessation by six months however this was no longer significant in an analysis including socio-demographics and six other psychological predictors (see Table 1). In a low quality Australian study of aboriginal infants, Craig et al. (2011) found no association between depressive symptoms and cessation by 2-3 weeks.

In summary, from a single study, there were inadequacies in the reporting of history of depression to determine its influence upon the early cessation of breastfeeding. However, associations were reported between post-delivery anxiety and depression symptoms and early cessation although when analysed with other factors, confounding influences accounted for this.

Social-cognition

Six studies have reported on the influence of social-cognitive elements such as postnatal beliefs, intention and self-efficacy, on the early cessation of breastfeeding. Bandura's Social Cognitive Theory (1986) suggests that self-efficacy, or confidence, has the greatest influence over behaviours and determines ability beliefs, outcome expectations, decisions about whether to attempt a behaviour, how much effort to exert and perseverance. Dennis (1999) applied the theory of self-efficacy to breastfeeding and developed an associated scale (Dennis, 2003) which is used frequently in the literature. The construct of perceived behavioural control is closely related to self-efficacy (Ajzen, 1991).

Two studies assessed beliefs and attitudes, O'Brien et al. (2008) found faith in breastmilk to meet their infant's needs, and women's self-belief in meeting their breastfeeding goal (McQueen et

al., 2015) predicted continuation of exclusive and any breastfeeding. Furthermore, the majority of studies reported that postnatal intention (Bai et al., 2010) and indicators of stronger intentionality, such as early timing of infant feeding decision (O'Brien & Fallon, 2005), longer planned duration (O'Brien et al., 2008), and greater intended level of breastfeeding (McQueen et al., 2015) predict continuation of exclusive or any breastfeeding.

Studies found early, low breastfeeding self-efficacy (or perceived behavioural control) predicted *exclusive* breastfeeding cessation within two months (McQueen et al., 2015; O'Brien & Fallon, 2005); however this relationship was not found at six months (Bai et al., 2010; McCarter Spaulding et al., 2009; O'Brien et al., 2008). Yet, early, low breastfeeding self-efficacy did predict early cessation of *any* breastfeeding up to six months postpartum (McCarter-Spaulding et al., 2009; O'Brien et al., 2008). Mothering self-efficacy did not predict continuation of breastfeeding at six months (O'Brien et al., 2008).

The findings of the six studies suggest the substantial influence of social-cognitive factors, such as beliefs, intentionality and self-efficacy upon breastfeeding continuation. However all of the studies measured social-cognitive factors after the commencement of breastfeeding and therefore early experiences may well have biased retrospective reports of prenatal planning and intention.

Perceived support

Only Quinlivan et al. (2015) measured prenatal general social support, using a validated questionnaire; however, there was no association with breastfeeding cessation.

Maternal psychosocial characteristics

O'Brien et al. (2008) explored the role of numerous maternal traits (see Table 1) and whether the infant was the mother's current priority. Of these factors, the only significant finding was of a small bivariate association between mothers' optimism and continuation, although this was negated in the multivariate analysis (see Table 1).

Early cessation summary

In summary, from the eight studies identified, there is some limited evidence for the contribution of maternal mental health in the early cessation of breastfeeding; however, this was commonly accounted for by other socio-demographic and psychological variables in multivariate analyses. Findings to support the importance of social-cognitive factors postpartum are perhaps more consistent; however, no studies have examined the strength of associations from prenatal assessment. One low quality study suggested that general indices of social support are not related to early cessation and one further moderate quality study found limited support for the importance of maternal traits. Such findings suggest further research is needed into these under-examined areas, with improvements to methodological limitations.

Breastfeeding Duration

Twelve studies assessed whether psychological factors predict the duration of breastfeeding, including women who never initiated breastfeeding in their analyses. Studies either examined the presence/absence of breastfeeding at a particular time-point or they examined the duration of breastfeeding as a continuous outcome.

Maternal mental health

Nine studies assessed the relationship between maternal mental health and breastfeeding duration. An absence of association between prenatal mental health and breastfeeding duration was reported by the majority of studies (Bailey et al., 2008; Bogen et al., 2010; de Jager et al., 2015; Spinelli et al., 2013; Stuebe et al., 2013). However, others found inconsistent evidence for associations between indices of poorer mental health and lower breastfeeding duration as outlined below (Dennis et al., 2014; Mathews et al., 2014; Figueiredo et al., 2014; Adedinsewo et al., 2014).

Three of the low quality studies which reported the absence of an association between prenatal mental health and breastfeeding duration had reported under-powering (Bailey et al., 2008; de Jager et al., 2015; Stuebe et al., 2013), limiting interpretation of this finding. However, the

absence of a relationship was also reported by Spinelli et al. (2013), in whose study all participants received an intensive healthcare intervention, and Bogen et al. (2010) who reported highly skewed attrition of 39% of participants at follow-up. These study characteristics may have undermined the ability to detect any association between depression and breastfeeding outcomes.

In contrast, three studies found prenatal mental health to be related to breastfeeding duration. In a sample of 145 low-risk women, Figueiredo et al. (2014) found that higher depressive symptoms in the first and third trimester, but not second trimester, predicted shorter durations of breastfeeding. Mathews et al. (2014) also found that prenatal depression correlated with shorter breastfeeding; however neither study tested this in an analysis with common confounders. In a low quality study, on account of limited reporting of results, Adedinsewo et al. (2014) found that higher prenatal anxiety was associated with non-exclusive (vs. exclusive) breastfeeding at three months and no breastfeeding at 12 months postpartum, however, these findings were no longer significant in models adjusted for covariates (see Table 1).

In the only study of the role of postnatal mood, Dennis et al. (2014) found that Canadian-born, but not migrant women, with depressive symptomology in the early postnatal period had reduced odds of exclusive breastfeeding at 16 weeks in an analysis accounting for extensive confounders (see Table 1).

The nine studies suggest equivocal findings regarding the relationship between maternal mental health and breastfeeding duration with eight studies measuring mental health prenatally. However, it is noted that there were methodological limitations which may have restricted the ability to detect associations and biased findings in those which reported no association. Within studies which found poor mental health predicted lower duration of breastfeeding, there were clear inconsistencies, with associations only being identified at some time-points, for some groups or no longer being evident when controlling for confounding variables.

Social-cognition

Seven studies assessed social-cognitive predictors of breastfeeding duration. Four studies (Bogen et al., 2010; Dennis et al., 2014; Bailey et al., 2008; McQueen et al. 2015) assessed early breastfeeding, and three further studies investigated outcomes to six months (de Jager et al., 2015; Lawton et al., 2012; Semenic et al., 2008).

Within a group of low quality studies, beliefs and attitudes towards breastfeeding or the mother's body were found to be unrelated to breastfeeding duration (Bailey et al., 2008; de Jager et al., 2015; Semenic et al., 2008); however, Lawton et al., (2012) found that positive prenatal affective attitude towards breastfeeding continued to be significant in predicting breastfeeding outcomes to six months.

Bogen et al. (2010) reported a strong relationship between *prenatal* intention and breastfeeding at 12 weeks in an analysis controlling for other covariates (see Table 1). Several studies have similarly reported that postnatal reports of having a planned duration of breastfeeding, plans to exclusively breastfeed and earlier timing of infant feeding decision (e.g., Dennis et al. 2014) predict early exclusive breastfeeding duration. However, plans and intention towards breastfeeding were not associated with longer durations up to six months (Lawton et al., 2012; Semenic et al., 2008; de Jager et al., 2015).

Three authors reported that prenatal general self-efficacy and breastfeeding self-efficacy (Bailey et al., 2008) or early postnatal breastfeeding self-efficacy and confidence (McQueen et al. 2015; Semenic et al., 2008) are predictive of higher levels of breastfeeding from four to 12 months.

The findings from social-cognitive predictors of breastfeeding duration have similarities to those reported for cessation. Indicators of intentionality maintained the strongest influence in early weeks but not to six months postpartum; there was limited support for a direct association with beliefs and attitudes and breastfeeding self-efficacy remained a strong, consistent predictor of breastfeeding duration, beyond six months postpartum.

Perceived support

Three of the aforementioned studies included measures of perceived support in their studies. Dennis et al. (2014) found bivariate associations, negated in the multivariate analysis (see Table 1), between the presence of breastfeeding support and exclusive breastfeeding duration, however Semenic et al. (2008) and Bailey et al. (2008) found no relationship between general or breastfeeding support and breastfeeding duration. Overall there is insufficient evidence from recent studies to reliably assess the importance of breastfeeding support or general social support as a predictor of duration.

Maternal psychosocial characteristics

Two studies assessed constructs relating to mother-infant interactions and breastfeeding duration. Pearson et al. (2011) used a task-based assessment of attentional sensitivity towards infant distress in a small sample finding that this did not predict breastfeeding duration, however breastfeeding outcomes were assessed variably between 3-6 months postpartum. Additionally, Mathews et al. (2014) undertook prenatal assessment of attachment coherence and beliefs about infant crying and whilst these were both significant in bivariate analyses, once controlling for sociodemographic factors and depressive symptoms, these were no longer significant.

Breastfeeding duration summary

A total of twelve studies reported on psychological predictors of breastfeeding duration. On balance, studies found inconsistent associations between anxiety and depressive symptomology and reduced breastfeeding duration; however, findings using psychiatric diagnoses or clinician rated symptoms found no associations. Social-cognitive elements such as greater breastfeeding intention and self-efficacy, predominately measured postpartum, were strongly predictive of breastfeeding duration, though breastfeeding self-efficacy retained its predictive influence for longer. Prenatal psychosocial characteristics, such as attentional sensitivity, adult attachment security and beliefs about infant crying were not found to be independently predictive of breastfeeding duration. Finally, from the limited studies conducted, general social support and breastfeeding support do not appear to be

independently associated with subsequent breastfeeding duration; however more research is required to clarify this.

Discussion

Key findings

The review identified prospective psychological predictors of breastfeeding which may be modifiable by intervention to increase rates of breastfeeding in the future. The commonality of factors identified in the prediction of breastfeeding initiation, cessation, duration and exclusivity implies that there are shared psychological influences which are more important than differences. Across these areas of study, intentionality had a consistent early association which lessened over time and breastfeeding self-efficacy had an enduring relationship with breastfeeding cessation and duration outcomes. Mental health was a variable predictor of the length of breastfeeding.

The most consistent evidence for protective psychological factors was within the social-cognitive domain, with intention to breastfeed having a significant influence upon breastfeeding outcomes for several months. These findings suggest support for the application of models such as the Theory of Planned Behaviour (Ajzen, 1991) to breastfeeding. Furthermore, measures indicating the stability and level of intention, for example, timing of infant feeding decision and planned level and duration of breastfeeding were found to be predictive of behavioural outcomes. However, authors who measured the direct effect of perceived behavioural control did not find an association; this is surprising considering its similarity to self-efficacy. There was some limited evidence for the direct association between maternal beliefs and attitudes and behavioural outcomes, however across the review this was found to be equivocal.

Bandura's Social Cognitive Theory (1986) received consistent support with the construct of postnatal breastfeeding self-efficacy, measured exclusively using the BSES-SF (Dennis, 2003), found to predict breastfeeding behaviour up to 12 months. Furthermore, breastfeeding self-efficacy was

found to be domain specific, with general self-efficacy and dispositional traits not exhibiting the same consistency of association.

There was no evidence to support the proposition that prenatal depressive symptoms predict breastfeeding initiation. However, there was a tendency within higher quality studies, which also exhibited lower risks of bias in their results, to find a bivariate relationship between higher depression and anxiety symptoms and greater likelihood of breastfeeding cessation and shorter duration. Continuous scores or clinical cut-offs on mental health screening tools, such as the EPDS (Cox, Holden & Sagovsky, 1987) and STAI (Spielberger, Gorsuch, Lushene, Vagg & Jacobs, 1983) were found to be directly associated with adverse breastfeeding outcomes; whereas, psychiatric diagnoses or clinician rated symptom severity were not. Other related mental health problems, such as low self-esteem and stress were not found to be predictive, though these were only reported by a few studies. These mental health findings are broadly in line with previous reviews; however the results are more equivocal, which may be attributable to the higher threshold of study quality imposed in the current report by excluding retrospective and cross-sectional designs.

There were very few studies which reported perceived support as a predictor of breastfeeding cessation and duration, with none predicting initiation. From these studies there was no evidence that general or breastfeeding support directly influenced breastfeeding outcomes.

There was limited support for the influence of maternal psychosocial characteristics and breastfeeding outcomes, however, there were few research studies in this area and they were often reported to be exploratory. The only direct significant finding, while controlling for confounding factors, was of maternal attachment coherence predicting breastfeeding initiation which highlights the potential importance of relational factors in influencing breastfeeding outcomes. This work requires replication to substantiate it. Other psychosocial characteristics such as dispositional traits, attentional sensitivity, and maternal priorities did not predict breastfeeding outcomes. However, the relative novelty of such research suggests that the refinement of measures may be indicated in future work.

Methodological Limitations

The interpretations of findings in this review were affected by the methodological limitations of studies. Many of the samples used were not representative of the population from which they were drawn and participants, which were not targeted underrepresented subgroups, typically met the sociodemographic profile of being married, older age and more highly educated. Furthermore, although all studies were longitudinal and prospective in relation to breastfeeding outcomes, many of them measured psychological predictors postnatally, introducing scope for the influence of very early infant feeding experiences upon maternal reports of prenatal intentionality.

The importance of social desirability in biasing self-report is an issue when women are being asked about health behaviours and although many studies sought to minimise this, the overall effect remains unknown. Therefore future studies should consider using additional sources to provide cross-validation of mothers' self-report.

Finally, although validated measures of psychological predictors were frequently used, the measurement of breastfeeding outcomes was often poorly defined and/or inconsistent across studies which reduced the comparability of findings. Furthermore, very few studies reported a comprehensive power analysis in determining the ability of their study to detect true associations or group differences. Therefore, the interpretation of non-significant results is highly problematic and may contribute to the apparent inconsistencies within the research findings.

Future Research

Future research is warranted in each of the areas described. Studies assessing the role of *prenatal* social-cognitive predictors of breastfeeding outcomes were seldom reported. This is a significant gap in the literature, particularly since there are rapid rates of breastfeeding cessation in the early postnatal period.

Although extensively researched to date, there remains a paucity of prospective assessment of the role of prenatal mental health; this is directly related to the high number of research studies which

recruit women postpartum. Surprisingly few studies have assessed the prospective role of perceived support and maternal psychosocial characteristics in breastfeeding outcomes. Findings reported in this review suggest affective and relational constructs may hold further promise in predicting the intimate and dynamic behaviour of breastfeeding an infant.

Recommendations for Clinical Practice

The findings from this review suggest that clinical practice could focus on the following areas in order to promote breastfeeding:

1. Good clinical practice should include exploration of breastfeeding beliefs and attitudes, which may inform women's intention to breastfeed and have some direct effect on behaviour.
2. Indicators of women's intentionality towards breastfeeding should be discussed with health professionals to identify women at greater risk of non-initiation or early cessation.
3. Due to the specificity of breastfeeding self-efficacy, perinatal interventions should target this particular domain, which may be more clinically and economically effective than attempting to shift global self-confidence.
4. Perinatal anxiety and depression should be monitored regularly, with recognition that maternal mental health may affect breastfeeding duration up to 12 months postpartum.

Review Limitations

This review purposely focused upon prospective research designs as an indicator of study quality. The effect of confounding physical health factors was minimised by excluding samples of women and infants with special healthcare needs and the impact of contextual variability was minimised by excluding cohorts of women recruited prior to 2003, and from non-industrialised countries. The findings therefore only represent a subsample of the existing published literature.

The search terms adopted were also noted to exclude studies which did not identify ''breastfeeding'' in the search fields, potentially omitting studies in which breastfeeding outcomes

were tangential to the main hypotheses. Finally, in only including published studies, the review may have been influenced by a bias towards the reporting of significant findings.

Conclusion

This review identified that prenatal depression was not associated with initiation of breastfeeding however relational, attitudinal and intentional factors were predictors. There was some evidence of a relationship between anxiety and depressive symptoms and early breastfeeding cessation however this was often accounted for by other factors in adjusted analyses. Early postnatal intentionality and self-efficacy were found to predict early cessation with some limited evidence for the influence of beliefs. Perceived support was not found to be independently related to early cessation or duration of breastfeeding. There were equivocal findings of anxiety and depressive symptoms in the prediction of reduced breastfeeding duration. Breastfeeding intentionality, affective attitude towards breastfeeding and breastfeeding self-efficacy continued to predict duration after controlling for confounding factors, with self-efficacy retaining the greatest influence over time. There was limited assessment of wider psychosocial characteristics, with any associations with breastfeeding negated when considered alongside confounding factors. Further prospective research is required to adequately examine possible associations between modifiable psychological factors and breastfeeding outcomes.

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Chapter 2: Are Breastfeeding Outcomes Predicted by Prenatal Mental Health, Maternal Orientation and Postnatal Affective Attitude Toward the Infant?[2]

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[2] Prepared for submission to The British Journal of Health Psychology (see Appendix 3)

Abstract

Objectives

To assess the relative contribution of psychological factors in the prediction of prenatal intention, initiation and early cessation of breastfeeding, after accounting for the role of confounding variables.

Design

Secondary data analysis of a prospective, longitudinal, community cohort of first-time mothers was conducted (N = 216), stratified by an index of relationship quality, inter-partner psychological abuse.

Methods

Depressive and anxiety symptoms and mothering orientation beliefs were assessed prenatally. Postnatal affective attitude towards the infant was coded from speech samples. Intention to breastfeed was measured at the two prenatal time-points. Breastfeeding outcomes were defined as intention, initiation and continuation of any breastfeeding at six weeks of age. Logistic regression modelling was undertaken to determine the relative contribution of psychological factors in the prediction of breastfeeding outcomes, after accounting for known predictors and relationship quality (sampling stratifier).

Results

Infant-feeding intention was found to be very stable from second to third trimester (r=.85). Prenatal mental health did not significantly predict intention. In multivariate analyses, intention to breastfeed was the strongest predictor of initiation at new-born. Mothering orientation was differentially associated with breastfeeding intention and early cessation. In controlled analyses, mothering orientation, lower levels of breastfeeding exclusivity at new-born and early affective attitude towards the infant each made an independent contribution to the early cessation of breastfeeding.

Conclusions

The findings indicate the importance of psychological factors in predicting breastfeeding outcomes. The identification of potentially modifiable psychological factors suggests that psychologically informed interventions may be used to improve breastfeeding outcomes with first-time mothers.

Introduction

Breastfeeding provides infants with a wide range of benefits; it is the optimal source of early nutrition, and has been associated with reduced risk of illness and immunological protection (World Health Organisation; WHO, 2009). The current recommendation is that infants should be exclusively breastfed for the first six months of life (WHO, 2002). In the UK, breastfeeding is initiated for 81% of infants, by six weeks 55% of infants are still receiving some breastmilk; and only 1% of infants are exclusively breastfed to six months (McAndrew et al., 2012). The early cessation of breastfeeding has been identified as a focus for improvement as early breastmilk has been found to confer particular benefits to neonates (WHO, 2009).

Maternal lifestyle factors such as smoking (Dennis, 2002) and perinatal factors such as early supplementation with formula milk (Thulier & Mercer, 2009) have been strongly associated with poorer breastfeeding outcomes. Furthermore, stable maternal factors such as older age, higher education, lower deprivation and non-single relationship status have repeatedly been found to predict breastfeeding intentions and behaviours (e.g., Mitra, Khoury, Hinton & Carothers, 2004; Dennis, 2002). Stable factors are not easily amenable to intervention by health professionals in the perinatal period, however, prospective psychological predictors of breastfeeding may present potential targets for modification to improve breastfeeding outcomes.

Psychological Predictors of Breastfeeding Outcomes

Studies have most commonly examined the predictive role of maternal depression in relation to reduced breastfeeding; however findings with regard to prenatal mental health are equivocal. In a recent review, prenatal depression was reported to be associated with shorter duration of breastfeeding

but not initiation (Dias & Figueiredo, 2015), yet, other reviewers have reported that antenatal

depressive symptomology *is* associated with lower likelihood of breastfeeding initiation (Grigoriadis

et al., 2013).   Furthermore, when confounding factors are included in analyses, the association

between prenatal depression and lower breastfeeding duration is less consistent (e. g. Bogen, Hanusa,

Moses-Kolko & Wisner, 2010). A recent small review reported mixed findings between prenatal

anxiety and breastfeeding in the context of very limited research (Fallon, Bennett & Harrold, 2015).

Prenatal mental health has been found to be similarly inconsistent in predicting breastfeeding

intention (e.g., Bogen et al., 2010; Insaf et al., 2011). Gaps and inconsistency within the literature

indicates the need for adequately controlled, prospective investigations to establish the independent

contribution of prenatal depression and anxiety symptoms in relation to breastfeeding.

The literature has also focused upon models of behavioural change, such as The Theory of

Planned Behaviour (TPB; Ajzen, 1991) to understand the impact of infant-feeding intentions and

associated attitudes, norms and perceived behavioural control over breastfeeding. A recent study

which prospectively measured TPB constructs alongside confounding factors found that attitudinal

and intention factors predicted breastfeeding initiation (Lawton, Ashley, Dawson, Warblinger &

Conner, 2012). The prenatal assessment of intention is also important when assessing early cessation

as postnatal experiences of breastfeeding may reciprocally inform factors such as perceived

behavioural control, which is hypothesised to influence intention. Ascertaining predictors of

breastfeeding outcomes prenatally also provides the opportunity for timely intervention in the context

of the steep decline of breastfeeding postpartum. To the author's knowledge there have been no

studies of breastfeeding which report on the stability of infant-feeding intention through pregnancy.

Yet, the temporal stability of intention has been found to be important in strengthening the association

between intentions and health behaviours (Sheeran & Abraham, 2003).

Theoretically related attitudinal and normative factors have been found to be associated with

breastfeeding intention (Dyson, Green, Renfrew, McMillan & Woolridge, 2010; Lawton et al., 2012).

However, only limited research has been undertaken considering mothers' prenatal beliefs about

parenting in respect to infant-feeding intentions (Barnes et al., 1997) and behaviours (Mathews, Leerkes, Lovelady & Labban, 2014).

The prenatal influence of societal norms and dynamic maternal attitudes towards infant-feeding intentions and behaviours has been proposed in a model specific to motherhood, delineating individual differences in the ways in which women consciously represent and approach their pregnancy, childbirth and childrearing practices (Raphael-Leff, 1985, 2005). The empirically validated model (see Van Bussell, Spitz & Demyttenaere, 2010) defines approaches to motherhood on a continuum of mother adapting to baby (facilitator) and baby adapting to mother (regulator); ''reciprocators'' are in the intermediate position, engaging in both approaches, underpinned by a stance of negotiation with the infant. Regulators are theorised to prefer mother-led, scheduled feeding, associated with a bottle-feeding method and facilitators preferring infant-led, demand feeding, associated with exclusive breastfeeding (Raphael-Leff, 2005). Two studies have found regulators to be more likely to plan (Sharp & Bramwell, 2004) and undertake (Roncolato, McMahon & Grant, 2014) supplementary bottle-feeding.

Mothers' experiences of their children and the dyadic relationship have also been hypothesised to influence parent-child interactions through relational schemas (Bullock & Dishion, 2007). It is proposed that mothers' early relational schema, represented by their affective attitude towards their infant, may also influence early interactions such as infant-feeding behaviours. In the context of negative feelings about the infant or where there is an absence of positive feelings expressed, the physical intimacy of breastfeeding may be more difficult to maintain. This relationship has not been explored to date.

In summary, there are equivocal findings about the influence of prenatal depressive symptomology and limited exploration of prenatal anxiety. Intentionality has been found to be important for early postnatal breastfeeding outcomes. However the stability of prenatal intention and psychological predictors of breastfeeding intention *and* behaviours have not been widely studied. Prospective, longitudinal research evaluating the contribution of prenatal mental health, intentions and

maternal orientation upon breastfeeding outcomes is needed. Finally, the extent to which affective attitude towards the infant may be important for the continuation of breastfeeding requires investigation. Early breastfeeding behaviour has been identified as a particularly important target due to the notable benefits of early breastfeeding for infants and the substantial drop in breastfeeding early postpartum.

In a sample of first-time mothers this investigation aims:

1. To assess the stability of prenatal intention to breastfeed from the second to third trimester of pregnancy.

2. To examine the single and joint contribution of prenatal mental health, alongside maternal socio-demographic, relationship and lifestyle factors in the prediction of second trimester breastfeeding intention and to examine these predictors plus the additional contribution of mothering orientation in the prediction of third trimester breastfeeding intention.

3. To examine the single and joint contribution of prenatal mental health, maternal orientation and prenatal intention to breastfeed alongside maternal socio-demographic, relationship and lifestyle factors, in the prediction of subsequent breastfeeding initiation.

4. To examine the predictors in (3) plus the additional contribution of postnatal affective attitude towards the infant and level of early exclusivity of breastfeeding, in the prediction of breastfeeding cessation by six weeks postpartum.

Method

Research Design

This investigation reports a secondary data analysis of an observational, longitudinal cohort of first-time mothers. Women presenting for antenatal care in a metropolitan borough of England were recruited consecutively during 2007-2008. A two-stage stratified design was used in which a subsample of participants was drawn from the general population sample.

Ethical approval for the parent study was granted by a Research Ethics Committee on the 27th June 2006 (see Appendix 4). Secondary analysis of the data for doctoral research by RP, supervised by an investigator from the parent study, was approved by The University of Liverpool DClinPsychol Research Review Committee on the 25th of June 2013 (see Appendix 5).

Participants

The parent study recruited women who were aged 18 and over and spoke English with surviving singleton babies (N=1233). All women reporting psychological abuse in a current or recent relationship (the stratification variable) and a random sample of those who did not were invited to take part in the intensive subsample (N=316). Of these women (49% low risk and 51% higher risk of future child development problems), three women were not included in the current study as their infants' gestational age was below 36 weeks, when infants may struggle to breastfeed due to immaturity (WHO, 2009). Full data on the variables of interest and therefore inclusion in this investigation was available from 216 participants, providing adequate power (see Appendix 6). For more detailed sampling information see the inclusion flow diagram (Appendix 7).

Procedure

Women were approached by a research midwife during antenatal appointments at 20 weeks gestation. Following a description of the study (see Appendix 8) and written informed consent (Appendix 9), women completed a questionnaire. At 32 weeks gestation a researcher invited women to join the intensive sample, when a further information sheet (Appendix 10), written informed consent (Appendix 11) and a battery of measures was completed. Postpartum assessments were undertaken at five weeks, followed by a postal questionnaire when the infant was nine weeks old.

Measures

Demographic questionnaire

At 20 weeks gestation, women reported on their age, pre-pregnancy smoking and relationship status, the Index of Multiple Deprivation (IMD; Noble et al., 2004) was calculated from their

postcode (see Appendix 12). Women's responses were categorised as most deprived quintile (coded 1) or other (coded 0), pre-pregnancy smoker (coded 1) or not (coded 0), married/cohabiting (1) or other (coded 0). Maternal age was retained as a continuous variable.

Stratification variable

At 20 weeks gestation the total number of items 'present' on the 20-item Dunedin Relationship Scale (Moffitt et al., 1997) (score range 0-20) was derived from participants' report of behaviour such as controlling or humiliating from and towards their partner (see Appendix 13). Women were categorised as having higher inter-partner abuse using a cut-off total score of 3 out of 20 or greater from the highest score of mother-to-partner or partner-to-mother scales. The cut-off was reduced to 2 out of 20 for later participants due to the low numbers of participants endorsing psychological abuse items. Higher relational abuse (coded 1) low risk (coded 0).

Maternal IQ

At 32 weeks mothers' predicted Full Scale IQ score was calculated from the best available estimate using the Wechsler Test of Adult Reading (Wechsler, 2001) (see Appendix 14) and level of education from UK normed data.

Maternal orientation

At 32 weeks the Antenatal Maternal Orientation Measure (Sharp & Bramwell, 2004) was used to assess a total of 11 expectations across the domains of a) self as new mother and b) the new-born infant (see Appendix 15). The scale uses seven-point bipolar scales (item score range 0-6) with poles endorsing theoretically regulator and facilitator responses. Items included: 'How do you imagine yourself in the first few weeks?' with item poles marked 'mostly trying to get the baby to adapt to a routine' (regulator) and 'mostly adapting to the baby' (facilitator). Women's scores across the 11 items were summed (scale score range 0-66) to create a linear scale of overall endorsement of regulator (low score) or facilitator (high score) poles, in comparison to other women in the sample. In line with theory, reciprocator women, who may endorse a blend of regulator and facilitator

expectations or consistently endorse a negotiated position, scored in the mid-range. The mean substitution up to 10% of missing items was followed as per Roncolato and McMahon (2011), who have further validated the construct.

Prenatal depression

At 20 and 32 weeks gestation the 10-item Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden & Sagovsky, 1987) provided a continuous measure of depressive symptomology (score range 0-30) (see Appendix 16). The EPDS has been validated for use in pregnancy (Murray & Cox, 1990); and had good internal consistency within this sample, Cronbach's alphas .82 -.84.

Prenatal anxiety

At 20 and 32 weeks gestation the 20-item State-Trait Anxiety Inventory (STAI; form Y, state version, Spielberger, Gorsuch, Lushene, Vagg & Jacobs, 1983) provided a continuous measure of anxiety symptoms (score range 20-80) (see Appendix 17). A mean substitution method was used for up to four missing items (Knight, Waal-Manning & Spears, 1983). The STAI has been validated for use in the perinatal period (Tendais, Costa, Conde & Figueiredo, 2014), Cronbach's alphas for the current sample .86 -.87.

Affective attitude towards the infant

Mothers' affective attitude was coded from a recorded five minute speech sample (FMSS) at five weeks postpartum (see Appendix 18). These were independently blind-coded by RP using the Family Affective Attitude Rating Scale (FAARS; Bullock & Dishion, 2004), a coding scheme for FMSSs about children, psychometrically validated against the FMSS for expressed emotion using positive and negative scores (Waller, Gardner, Dishion, Shaw & Wilson 2012). Ratings from five warmth items (positive relational scale; PRS) and five critical items (negative relational scale; NRS) were assessed (Bullock & Dishion, 2007).

The FAARS comprises of ordinal data (PRS/NRS score range 5-45) with ratings from '1' 'not at all' to '9' 'clearly/multiple examples' on a nine-point scale. To reach the scale mid-point a

respondent must make a concrete statement, for example, communicating emphatic

(positivity/negativity) 'he's absolutely gorgeous/awful'. Minor adjustments were made to the FAARS

record form (see Appendix 19) and exploratory additions to the coding scheme for novel use with a

population of infants (see Appendix 20).

Raters were trained using the coding manual (Bullock, Schnieger & Dishion, 2005) and

gained inter-rater reliability with FAARS authors (intra class correlations; ICCs .7 & above), and for

the current study (ICCs for criticism items .67 - 1.00 & warmth items .64 - 1.00) (see Appendix 21).

The FMSSs were then rated with consensus meetings conducted to resolve issues and maintain

reliability over time.

Due to the low incidence of criticism on the NRS (n=24), the presence/absence of

''criticism'' was made into a binary variable. The internal consistency of the PRS was unacceptable,

Cronbach's alpha .35, consequently an exploratory factor analysis was undertaken. Based on

inspection of the screeplot and eigenvalues (1.57 & 1.17), a two factor solution was extracted (see

Appendix 22); (i) positive statements about behaviours, traits and intentionality of the infant ''positive

comments'' and (ii) positive statements about the shared relationship and love for the infant ''positive

relationship''. Two composite total scores were created using the items which had their primary

loading on each factor. The composite scores were dichotomised by median split and women who

expressed comparatively low levels of positive comments *and* positive relationship were grouped as

''low warmth'' (n=37). Finally, women expressing either low warmth or criticism were then grouped

into a '*low positive or negative affective attitude*' category (n=50) coded (1), those with the presence

of high warmth and absence of criticism coded (0).

Breastfeeding

Intention

At 20 and 32 weeks gestation, women indicated how they intended to feed their baby: 'mostly

breastfeed'...'mostly bottle-feed' on a seven-point bipolar scale (see Appendix 23). Responses on the

three points nearest 'mostly breastfeed' were coded as intention to breastfeed (1) and responses at the

mid-point or towards 'mostly bottle-feed' were coded as being unsure or greater bottle-feeding intention (0).

Initiation and continuation

At nine weeks postpartum, women indicated when their baby was new-born (and separately, six weeks old) if they 'mostly breastfed … mostly bottle-fed' on a seven-point bipolar scale (scale range 0-6) and if they bottle-fed using formula milk/breastmilk/both (see Appendix 24). Women reporting bottle-feeding 'formula milk only' and indicating 'mostly bottle-feeding' at the (6) pole were ''no breastfeeding'' (coded 0). All other women who scored 0-5 on the scale, or 6 and also said they bottle fed breastmilk or both breast and formula milk were categorised as ''any breastfeeding'' (coded 1) and classed as initiating at new-born.

Women who did not initiate (n=40) were excluded from the continuation analysis. Using the same categorisation for women's breastfeeding status when their infant was six weeks old, women who initiated and reported any breastfeeding were ''continuing'' (coded 1), otherwise they had ''ceased'' (coded 0). At both initiation and continuation, women engaging in all forms of breastfeeding including exclusive, mixed with formula feeding and those bottle-feeding any breastmilk were included in the breastfeeding group.

Level of exclusivity

A continuous score of new-born exclusivity of breastfeeding using the seven-point bipolar scale of mostly breastfeeding… mostly bottle-feeding (scale range 0-6) was used for those who initiated, with responses at (0) indicative of exclusive breastfeeding and higher scores indicating greater levels of supplementary bottle-feeding.

Results

Data Analysis

Data input accuracy, missing data and parametric assumptions were addressed (see Appendix 25); analyses were undertaken using IBM SPSS Statistics v.22. Bivariate associations were examined using appropriate parametric and nonparametric correlations. Binary logistic regression analyses were performed to examine predictors of (i) second and third trimester breastfeeding intention (vs. being unsure/greater intention to bottle-feed); (ii) initiation of any breastfeeding (vs. non-initiation), and (iii) continuation of any breastfeeding at six weeks (vs. cessation). Variables were entered into models in sequential blocks of socio-demographic factors (maternal age, IQ, deprivation), relationship factors (inter-partner psychological abuse, living with partner), lifestyle (pre-pregnancy smoking), mental health (depressive and anxiety symptomology), mothering beliefs (maternal orientation), prenatal breastfeeding intention, level of new-born breastfeeding exclusivity and postnatal feelings expressed towards the infant (affective attitude). Parallel models were run with depressive and anxiety symptoms to avoid multicollinearity with only the most proximal time-point of mental health assessment included.

A theory-driven approach to the multivariate analyses was adopted with final models retaining all variables to examine the robustness of associations whilst controlling for the maximum number of confounding factors. Dichotomous variables were dummy coded 0/1; transformed continuous variables were entered where there were significant deviations from normality to support a more stable solution. Odds ratios of greater than 1 indicate greater likelihood of breastfeeding intention, initiation or continuation; odds ratios below 1 indicate lower likelihood. The level of significance was set at $p<.05$.

Sample characteristics

A total of 95% of women in the sample were white British, representative of the local population, and 36% were from the most deprived quintile of the UK, consistent with the high levels of deprivation in some areas of the recruitment site. The majority of women were married/cohabiting

(78%) and 80% had continued education after age 16; 39% reported smoking in the year before their pregnancy. The rates of initiation and continuation of breastfeeding at six weeks were 81% and 56%, consistent with the incidence of initiation (81%) and continuation (55%) of breastfeeding in mothers across the UK (McAndrew et al., 2012). The sample means and standard deviations of continuous variables and associations between factors are displayed in Table 1.

Table 1

Variable means, standard deviations and bivariate correlation (N = 216)

Variable (greater score)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Relational psychological abuse (higher)	-																
2. Maternal age (older)	**.24****c	-															
3. Deprivation (higher)	.09d	**.37****c	-														
4. Lifestyle (pre-pregnancy smoking)	**.20****d	**-.41****c	**.17***d	-													
5. Partner status (married/cohabiting)	**-.22****d	**.41****e	**-.26****d	**-.22****d	-												
6. 20 week depressive symptoms (higher)	**.43****c	**-.23****b	.07c	**.36****c	**-.39****e	-											
7. 20 week anxiety symptoms (higher)	**.34****c	-.06b	.02c	.08c	**-.32****e	**.66****b	-										
8. 20 week intention (breastfeeding)	**-.17***d	**.28****c	**-.15***d	**-.21****d	**.16***d	-.09c	.00c	-									
9. 32 week maternal orientation (facilitator)	-.16c	-.05a	-.15c	-.03c	.01e	-.10b	**-.16***b	**.23***c	-								
10. Maternal predicted IQ (higher)	-.16c	**.39****a	**.37****c	**-.33****c	**.27****e	-.12b	.09b	**.37****c	.00a	-							
11. 32 week depressive symptoms (higher)	**.46****c	**-.25****b	.01c	**.41****c	**-.32****e	**.68****b	**.47****b	-.15c	-.10b	-.11b	-						
12. 32 week anxiety symptoms (higher)	**.33****c	**-.15***b	.03c	.14c	**-.26****e	**.52****b	**.55****b	.00c	**-.14***b	.04b	**.61****b	-					
13. 32 week intention (breastfeeding)	**-.17***d	**.32****c	-.11d	**-.19****d	**.20****d	-.09c	.03c	**.85****d	**.22***c	**.34****c	-.15c	-.01c	-				
14. New-born initiation (breastfeeding)	**-.18****d	**.41****c	**-.19****d	**-.18****d	**.30****d	-.18c	-.04c	**.61****d	.06c	**.41****c	**-.25***c	.00c	**.62****d	-			
15. New-born BF exclusivity (lower)	**.30****c	**-.19***b	**.22***c	**.24****c	**-.24****e	**.15***b	.13b	**-.73****c	-.06b	**-.24****b	**.16***b	.03b	**-.75****c		-		
16. Affective attitude (criticism/low warmth)	-.02d	-.03c	.10d	.07d	-.06d	.00c	.03c	-.08d	-.02c	-.07c	.03c	.01c	-.07d	**-.13***d	.13c	-	
17. 6 week breastfeeding (continuation) f	-.09d	-.04c	-.10d	-.04d	.01d	.01c	-.01c	.11d	**-.23***c	-.02c	.05c	.08c	.09d		**-.69****c	-.11d	-
Mean		28.3				8.27	32.7		43.97	107.5	8.22	33.37			1.19		
SD		5.92				5.3	11.97		6.56	6.56	4.63	9.9			1.95		
Scale range						0-30	20-80		0-66		0-30	20-80			0-6		

Note. BF = breastfeeding, [a] = (*r*) Pearson product-moment correlation coefficient, [b] = (r_s) Spearman rank-order correlation coefficient, [c] = (r_b) biserial correlation coefficient, [d] = (r_φ) phi coefficient, [e] = (r_{pb}) point biserial correlation coefficient, [f] = n 176.
Significant correlations in boldface * $p < 0.05$, ** $p < 0.01$.

Stability of Prenatal Intention

Infant-feeding intention was stable during pregnancy with a strong positive association between the second and third trimesters (r_φ = .85, p < .001) and 72% of variance shared. Less than 5% of women changed their infant-feeding intention between these two prenatal time-points. Due to this high level of association, analyses of intention as a predictor of postnatal breastfeeding outcomes used 32 week intention only.

Predictors of Second Trimester Intention

In bivariate analyses (see Table 1), second trimester breastfeeding intention was significantly associated with older maternal age, lower deprivation, higher IQ, living with a partner, lower inter-partner psychological abuse and not smoking before pregnancy. Concurrent depressive and anxiety symptoms were not significantly associated with early breastfeeding intention in this sample.

When all these variables were entered into a multivariate analysis (see Table 2), only higher IQ remained a significant independent predictor of early breastfeeding intention (OR 1.07, 95% CI 1.00-1.14, p = .036). The final model contributed significantly to the prediction of breastfeeding intention compared to the constant-only model (Chi-square (7) = 23.00, p=.002), accounting for 17% of the variance. This indicates that the set of predictors distinguished between first-time mothers who intended to breastfeed early in pregnancy and those who were unsure or expressed greater intention to bottle-feed.

Predictors of Third Trimester Intention

In bivariate analyses (see Table 1), third trimester breastfeeding intention was predicted by older maternal age, higher IQ, living with a partner, lower inter-partner psychological abuse, not smoking before pregnancy and maternal orientation scores indicative of a greater facilitator orientation in line with theory. Deprivation and concurrent depressive and anxiety symptoms were not associated with late prenatal breastfeeding intention.

When all these factors were entered into a multivariate analysis (see Table 2), only greater facilitator orientation remained a significant independent predictor of late prenatal breastfeeding intention (OR1.07, 95% CI 1.01-1.13, p = .028). The final model contributed significantly to the prediction of breastfeeding intention compared to the constant-only model (Chi-square (8) = 26.75, p = .001), accounting for 19% of the variance. This indicates that the set of predictors distinguished between first-time mothers who intended to breastfeed late in pregnancy and those who were unsure or expressed greater intention to bottle-feed.

Table 2

Logistic regression model for second and third trimester breastfeeding intention

| | Second trimester intention (N = 216) | | | | | | Third trimester intention (N = 216) | | | | | |
Predictor	B	SE B	Sig.	O.R	95% CI for OR Lower	Higher	B	SE B	Sig.	O.R	95% CI for OR Lower	Higher
Maternal age	0.02	0.04	.635	1.02	0.94	1.10	0.05	0.04	.184	1.06	0.97	1.14
Maternal IQ	0.07	0.03	.036	1.07	1.00	1.14	0.06	0.03	.087	1.06	0.99	1.13
Deprivation	-0.29	0.41	.484	0.75	0.34	1.68	-0.08	0.42	.849	0.92	0.40	2.11
Living with partner	-0.67	0.42	.114	0.51	0.22	1.17	-0.47	0.43	.267	0.62	0.27	1.44
Inter-partner psychological abuse	0.18	0.49	.717	1.19	0.46	3.10	0.46	0.46	.322	1.58	0.64	3.93
Pre-pregnancy Smoking	-0.67	0.41	.103	0.51	0.23	1.15	-0.45	0.41	.276	0.64	0.29	1.43
Prenatal depressive symptomology	0.06	0.73	.936	1.06	0.26	4.39	0.29	1.15	.804	1.33	0.14	12.75
Maternal orientation							0.07	0.03	.028	1.07	1.01	1.13
Constant	-5.69	3.90	.145	0.00			-9.45	5.23	.071	0.00		

Note. OR = odds ratio. Second trimester intention: Total model Chi-square (7) = 23.00, p=.002 R^2 = .17 (Nagelkerke). Third trimester intention: Total model Chi-square (8) = 26.75, p=.001 R^2 = .19 (Nagelkerke). In parallel models which included prenatal anxiety in the mental health block, there was no change to the pattern of significance for individual predictors or the overall model.

Predictors of Breastfeeding Initiation

In bivariate analyses (see Table 1), breastfeeding initiation was predicted by older maternal age, lower deprivation, higher IQ, living with a partner, lower inter-partner psychological abuse, not

smoking before pregnancy, lower depression symptoms and prenatal intention. Anxiety symptoms and maternal orientation were not significantly associated with breastfeeding initiation.

When all these factors were entered into a multivariate analysis (see Table 3), only prenatal intention remained a significant independent predictor of breastfeeding initiation (OR 26.34, 95% CI 9.56-72.59, $p < .001$). The final model contributed significantly to the prediction of breastfeeding initiation compared to the constant-only model (Chi-square (9) = 84.81, $p < .001$), accounting for 53% of the variance. This indicates that the set of predictors distinguished between first-time mothers who initiated breastfeeding and those who did not. Women with prenatal intention to breastfeed were 26 times more likely to initiate breastfeeding than those who were unsure or had greater intention to bottle-feed.

Predictors of Breastfeeding Continuation

In bivariate analyses (see Table 1), the continuation of breastfeeding at six weeks was significantly associated with a more regulatory maternal orientation and the initiation of a more exclusive level of breastfeeding at new-born. Sociodemographic, relationship and lifestyle factors, depressive and anxiety symptomology, prenatal intention and postnatal affective attitude towards the infant were not significantly associated with the continuation of breastfeeding.

When all these factors were entered into a multivariate analysis (see Table 3), maternal orientation (OR 0.91, 95% CI 0.85-0.98, $p = .008$), level of breastfeeding exclusivity (OR 58.10, 95% CI 13.69 – 246.58, $p < .001$), and early affective attitude towards the infant (OR 0.40, 95% CI 0.17-0.98, $p = .046$), each contributed independently to the prediction of the continuation of breastfeeding. The odds of women continuing to breastfeed at six weeks were significantly increased by a more regulatory maternal orientation, higher breastfeeding exclusivity at new-born and the expression of greater warmth or the absence of criticism towards their infant. The final model contributed significantly to the prediction of breastfeeding continuation compared to the constant-only model, (Chi-square (11) = 61.42, $p < .001$), accounting for 41% of the variance. This indicates that the set of

predictors distinguished between first-time mothers who continued breastfeeding at six weeks post-

partum and those who had ceased by six weeks.

Table 3

Logistic regression model for breastfeeding initiation and continuation

	Initiation (N = 216)						Continuation (n = 176)					
Predictor	B	SE B	Sig.	O.R	95% CI for OR Lower	Higher	B	SE B	Sig.	O.R	95% CI for OR Lower	Higher
Maternal age	0.03	0.05	.540	1.03	0.93	1.14	0.01	0.04	.888	1.01	0.93	1.09
Maternal IQ	0.05	0.04	.200	1.05	0.97	1.14	-0.04	0.04	.238	0.96	0.89	1.03
Deprivation	-0.56	0.54	.293	0.57	0.20	1.63	-0.55	0.44	.215	0.58	0.24	1.37
Living with partner	-0.25	0.54	.642	0.78	0.27	2.24	-0.30	0.42	.478	0.74	0.32	1.70
Inter-partner psychological abuse	0.72	0.59	.217	2.06	0.65	6.50	0.17	0.66	.790	1.19	0.33	4.30
Pre-pregnancy Smoking	0.24	0.53	.651	1.27	0.45	3.56	0.04	0.47	.937	1.04	0.41	2.62
Prenatal depressive symptomology	-1.81	1.49	.225	0.16	0.01	3.03	1.45	1.17	.212	4.28	0.44	42.05
Maternal orientation	-0.01	0.04	.846	0.99	0.92	1.07	-0.09	0.03	.008	0.91	0.85	0.98
Prenatal intention	3.27	0.52	<.001	26.34	9.56	72.59	0.62	0.82	.446	1.86	0.38	9.26
Level of breastfeeding exclusivity a							4.06	0.74	<.001	58.10	13.69	246.58
Affective attitude							-0.91	0.45	.046	0.40	0.17	0.98
Constant	-1.26	6.63	.849	0.28			-3.39	5.32	.524	0.03		

Note. OR = odds ratio. Initiation: Total model Chi-square (9) = 84.81, p<.001 R^2 = .53 (Nagelkerke). Continuation: Total model Chi-square (11) = 61.42, p<.001 R^2 = .41 (Nagelkerke). In parallel models which included prenatal anxiety in the mental health block, there was no change to the pattern of significance for individual predictors or the overall model. [a] The transformation to normalise level of breastfeeding exclusivity variable reversed the direction of scores from bivariate correlations and the OR cannot be interpreted directly.

Discussion

This prospective longitudinal investigation revealed that there was a very high level of

stability in breastfeeding intention from the second to third trimester and that prenatal intention was

by far the strongest predictor of breastfeeding initiation. No other socio-demographic, relationship,

lifestyle, mood or maternal orientation variables predicted initiation once intention was accounted for

in the current study. Other recent prospective studies have found similarly strong associations

between prenatal intention and initiation (Bogen et al., 2010; Lawton et al., 2012). This finding

suggests that modifying intention to breastfeed or the factors that predict intention during pregnancy

may be important targets for future intervention.

The novel finding of stability of infant-feeding intention across the second and third trimester

of pregnancy suggests that prenatal interventions to influence infant-feeding intentions may usefully

be targeted early in the gestational period.

The only psychological predictor in the multivariate model for second trimester intention,

mental health, did not predict early intention. This is the only study to the author's knowledge which

has identified maternal predicted IQ as the sole predictor of early breastfeeding intention in an

adjusted analysis. This finding reinforces the importance of controlling for maternal functioning

when assessing associations between breastfeeding and child outcomes (e.g. Horta & Victora, 2013).

Importantly, in this study, third trimester intention was predicted by a more facilitatory

maternal orientation, with beliefs about an infant-led approach to mothering, when other key factors

were accounted for. This is consistent with a previous finding (Sharp & Bramwell, 2004) and suggests

that individual differences in mothers' beliefs about themselves and their infants have developed

prenatally and pose a potential target for understanding and intervening to increase intention to

breastfeed.

The finding that prenatal mental health had no association with breastfeeding intention or

cessation, and prenatal depressive symptoms were only a significant predictor of initiation in bivariate

analyses, sits in the context of mixed results within the literature, where even reviews have reported

opposing findings (Dias & Figueiredo, 2015; Grigoriadis et al., 2013). Prenatal anxiety was not

associated with any breastfeeding outcomes in this investigation, which adds to the growing literature

that broadly supports a null finding (Fallon et al., 2015).

Amongst women who initiated breastfeeding, cessation prior to six weeks of age was

significantly predicted by level of breastfeeding adherence at new-born, prenatal maternal orientation

and lower levels of warmth or the presence of criticism expressed towards the baby after sociodemographic, lifestyle and relationship factors, and prenatal mental health were accounted for.

The association between early supplementary use of bottle-feeding and premature cessation has been well established in the literature (Dennis, 2002) and may be attributable to initial breastfeeding difficulties, reduced confidence in breastfeeding or an interaction between various factors. The strength of this finding in an adjusted analysis highlights the potentially deleterious effect of early bottle-feeding upon the maintenance of any breastfeeding, even where the majority of women held prenatal intention to breastfeed.

Interestingly, although women with a more facilitator orientation prior to birth, showed stronger intention to breastfeed, women with a more regulatory prenatal orientation, who initiated *any* breastfeeding, were more likely to maintain some breastfeeding at six weeks of age. However, in using a linear scale of maternal orientation, women's prenatal expectations were not categorised according to the theoretical groupings and therefore it is not possible to determine the extent to which women with a reciprocator orientation influenced these findings.

The only other study to investigate maternal orientation and breastfeeding practices found an association between less regulatory antenatal expectations (on a linear scale) and exclusive breastfeeding at six months postpartum (Roncolato et al., 2014). However, the use of different time-points (six months vs. six weeks postpartum) and measures of breastfeeding (exclusive vs. breastfeeding including formula supplementation) across the two studies renders direct cross-study caparisons difficult.

The current finding does suggest that there is a relationship between first-time mothers' infant-feeding plans and outcomes depending on their prenatal conceptions of mothering. Findings could be interpreted as suggesting that for women with a more idealised prenatal expectation of naturally facilitating their infant's needs, common experiences such as breastfeeding difficulties, may conceivably contribute to greater likelihood of ceasing a non-idealised form of (supplemented) breastfeeding. In contrast, women with a more regulatory orientation, who perceive their role as

finding ways to regulate their infant to fit into their lives, may be more accepting of mixed-feeding with formula following initiation of breastfeeding.

The finding that women, who expressed a less positive or more negative affective attitude towards their infant, were less likely to maintain breastfeeding suggests that mothers' representations of their infants and their relationship are connected to the continuation of breastfeeding. This may be attributed to the necessity for intimacy with an infant during breastfeeding, which may be more difficult to sustain if a mother is experiencing a paucity of warmth or the presence of ambivalent or negative feelings. Equally, women's affective attitude may be influenced by breastfeeding experience, as the dyadic-relationship may be supported by the closeness of breastfeeding. Due to the concurrent timing of measurement in this investigation, the direction of this relationship was not determinable. However, this important finding is the earliest association reported, to the authors' knowledge, between maternal expressed emotion and caregiving behaviours where substantial evidence linking these factors exists in older children (e.g., Bullock & Dishion, 2007; Waller et al., 2012).

The relevance of maternal orientation and affective attitude towards the infant to breastfeeding continuation indicates the importance of the relational aspects of the mother's experience of their infant in breastfeeding outcomes. The inclusion of psychologists in perinatal practice may stimulate the provision of interventions to support early mother-infant relationships and develop understanding of the individual meaning of breastfeeding, widening the focus of prenatal education programs from the mechanics of breastfeeding.

The absence of an association between prenatal intention and early breastfeeding continuation can be contrasted to studies that have found a link with breastfeeding duration (e. g., McMillan et al., 2008); however, some of the association may be attributable to initiation, as non-initiators were included in analyses. The current study findings suggest that breastfeeding support services have an opportunity to intervene to promote the maintenance of breastfeeding in the intention-behaviour gap.

Strengths and Limitations of the Study

The study's main strengths were in its longitudinal design, which allowed for the majority of predictors to be measured prospectively and for outcome assessment at multiple time-points; the focus on first-time mothers controlled for any confounding of findings by parity. The use of a stratified sampling procedure, to oversample mothers who present with a risk factor for child development problems, ensured that mothers were from varied backgrounds, with rates of breastfeeding initiation and continuation at six weeks in line with the UK.

The breadth of psychological variables explored was a relative strength of the study, with analyses controlling for socio-demographic, lifestyle and relationship factors associated with breastfeeding. The assessment of psychological variables in the study used predominantly validated measures, with affective attitude assessed from blind rated FMSSs. Novel findings from the study require replication, in particular, there may be limitations to how generalizable the findings regarding affective attitude are as warmth factors were determined from an exploratory factor analysis and the level of warmth was derived using a median split from within this cohort's parameters. Also, the low level of criticism restricted the measurement of negative feelings to a binary variable.

The investigation of breastfeeding at prenatal and postnatal time-points allowed for the finding of maternal orientation being differentially associated with intention and continuation to be identified. However, future research should seek to categorise women's orientations in order to elucidate the influence of reciprocator expectations upon the findings identified. Furthermore, in adopting a broad definition of breastfeeding (including women who also supplemented with infant formula), the study cannot distinguish how prenatal expectations may have related to the initiation and continuation of exclusive breastfeeding in the early postnatal period.

The definitions of breastfeeding in this study were not allied to any formal classification system and were reported retrospectively. Finally, the aims and research questions examined focused on the mother-infant dyad to the exclusion of wider influences which are known to exert influence on women's breastfeeding behaviour (Dennis, 2002).

Clinical Implications

The findings from this study suggest that the clinical practice of perinatal health professionals such as midwives, health visitors and clinical psychologists could focus on the following areas in order to promote breastfeeding:

1. Prenatal expectations of motherhood could be explored in order to understand individual differences in women's conceptions of their role to inform interventions to promote breastfeeding intention and continuation.

2. Prenatal interventions to increase breastfeeding intention may be usefully targeted early in the gestational period.

3. Early postnatal interventions to support breastfeeding following initiation may be effectively targeted at women with and without prenatal intention to breastfeed.

4. The provision of specialist perinatal services, which support women's mental health as well as infant health outcomes, may usefully explore women's feelings towards their infant in addition to symptomology when seeking to understand and support breastfeeding.

Future Research

On account of the novelty of the investigation of the temporal stability of intention and breastfeeding outcomes, and its importance in predicting other health behaviours (Sheeran & Abraham, 2003), further research examining this relationship is warranted. As maternal mental health did not predict early intention, future research should examine alternative psychological factors at this time-point

Due to the significant relationship between the supplementation of breastfeeding and early cessation, the contribution of psychological variables to the reduced exclusivity of breastfeeding at new-born is an important avenue for future exploration; this has only been identified in one recent prospective study (Figueiredo, Canario & Field, 2014).

The maternal orientation findings indicate the need for future research to examine the interplay between maternal orientation, breastfeeding expectations and experiences upon breastfeeding cessation to elucidate the relationships found in this study. Furthermore, the delineation of maternal orientation categories would help to separate the relative contribution of facilitator, reciprocator and regulator expectations.

Conclusion

Infant-feeding intention was found to be very stable from second to third trimester of pregnancy in first-time mothers and prenatal intention to breastfeed was the strongest predictor of initiation. Psychological factors, such as mothering orientation, may exert influence over breastfeeding intention and early cessation differentially from the prenatal to postnatal period. Prenatal psychological beliefs about mothering, lower levels of exclusive breastfeeding at new-born and affective attitude towards the infant each played a role in the early cessation of breastfeeding by six weeks of age.

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Appendix 1: Literature Review Journal Guidelines

The International Journal of Nursing Studies guidelines taken from:

https://www.elsevier.com/journals/international-journal-of-nursing-studies/0020-7489/guide-for-authors

- Papers up to 7,000 words in length, plus tables, figures, and references.

- References can be in any style or format as long as consistent.

Appendix 2: Quality Assessment Record Form

For examination purposes only

Appendix 3: Empirical Paper Journal Guidelines

The British Journal of Health Psychology guidelines taken from:

http://onlinelibrary.wiley.com/journal/10.1111/%28ISSN%292044-8287/homepage/ForAuthors.html

- Papers no more than 5000 words (excluding the abstract, reference list, tables and figures).

- Use APA style.

Appendix 4: NHS Ethical Approval Letter

For examination purposes only

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Appendix 5: University Research Approval

For examination purposes only

Appendix 6: Power calculation

A power analysis for bivariate associations was conducted using G*POWER 3.1.7 (Faul, Erdfelder, Buchner & Lang, 2009) which indicated that a sample size N=67 was required assuming alpha = .05, Beta = .20 and a medium effect size =0.3 (Cohen, 1992). A sample size of 216 allows multivariate models containing up to 21 predictor variables using a guideline requirement of at least 10 cases per variable (Tabachnik & Fidell, 2013).

References

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Appendix 7: Participant Flow Diagram

For examination purposes only

Appendix 8: 20 Week Information Sheet

For examination purposes only

For examination purposes only

For examination purposes only

Appendix 9: 20 Week Consent Form

For examination purposes only

Appendix 10: 32 Week Information Sheet

For examination purposes only

For examination purposes only

For examination purposes only

For examination purposes only

Appendix 11: 32 Week Consent Form

For examination purposes only

Appendix 12: Socio-demographic questions

For examination purposes only

Appendix 13: The Dunedin Relationship Scale

For examination purposes only

Appendix 14: Wechsler Test of Adult Reading

For examination purposes only

Appendix 15: Antenatal Maternal Orientation Measure

For examination purposes only

Appendix 16: Edinburgh Postnatal Depression Scale

For examination purposes only

Appendix 17: State-Trait Anxiety Inventory

For examination purposes only

Appendix 18: FMSS Instructions

For examination purposes only

Appendix 19: Family Affective Attitude Rating Scale (FAARS) Record Form

For examination purposes only

For examination purposes only

Appendix 20: FAARS Trial Application to a Novel Sample

A trial application of the FAARS coding scheme to mothers speaking about their new-born infants was undertaken during which low ratings of criticism were observed. In seeking to identify small variations in the negative relational scale (NRS), additional coding of a count of negative comments was chosen as this was anticipated add sensitivity to the rating scale. A count of comments has been adopted by other authors using adapted FMSSs with children (e.g., Caspi et al., 2004). This additional measure drew on content from the FMSSs which were already being noted for scoring on the rating scale. Consequently, the scoring form was minimally adapted and counts of comments (weak and concrete) were gathered alongside ratings for each scale.

Final Sample

When the level of criticism in the final sample (N=216) was explored there were only 11 counts of critical comments, however, there were 24 women with ratings greater than 'not at all' on the NRS. The NRS included those indicating criticism but without concrete evidence, such as through the application of the rater's global impression of the FMSS or where ambiguous comments were made. The coding of subtle forms of criticism has been used by other authors as an appropriate developmental adaptation to rating negativity in FMSSs about young children (Daley, Sonuga & Thompson, 2003). Therefore, the presence of a rating was adopted to determine criticism in this sample rather than counts of comments.

References

Caspi, A., Moffitt, T. E., Morgan, J., Rutter, M., Taylor, A., Arseneault, L., … Polo-Tomas, M. (2004). Maternal expressed emotion predicts children's antisocial behavior problems: Using monozygotic-twin differences to identify environmental effects on behavioral development. *Developmental Psychology*, *40*(2), 149–161. http://doi.org/10.1037/0012-1649.40.2.149

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Appendix 21: FAARS Inter-Rater Reliability

The robust assessment of inter-rater reliability of FAARS coding has been reported in two studies to date with intra class correlations (ICCs) in the range of 0.56-0.98 (Bullock & Dishion, 2007) and 0.68-0.95 (Pasalich et al., 2011) at the item level on the positive relational scale (PRS) and negative relational scale (NRS). The count and rating data employed in this study had a high range of possible scores which precluded the use of statistics such as Cohen's weighted kappa, which is invalidated where there are high quantities of '0' values in matrices. ICCs were selected for the analysis due it robustness in calculating inter-observer variability and discriminating coder agreement by chance. It is noted that the data does not meet parametric assumptions and therefore ICC statistics should be interpreted with caution, however, Field (2005) indicates that ICC's are appropriate for ordinal data.

Results

A stratified-random sample of 40 FMSSs were taken from the available sample (N=267). The coders were blind to the respondents' risk-group status. ICCs were undertaken using a two-way model to consider the source of data (coder 1 or 2) and variability of scores. A single measures design was employed as raters' scores were analysed individually and not averaged. Ratings were compared on the basis of the more robust 'absolute agreement' rather than consistency so as to capture relative differences between coders. As the two raters represent a sample of a larger population of raters which could have been used, a random effects interpretation was made on the data.

The ICCs for the NRS and PRS were each high at .91 (see Table 1). The NRS results were underpinned by a floor-effect with three of the five items unused within the sample, with the remaining two being utilised in approximately 10% of the FMSSs. However, the PRS was more broadly rated with all items except intentionality being used frequently. The range of ICCs for critical and warmth items (.67-1 & .64-1) were comparable to those reported by other authors.

Table 1

Inter-rater reliability analysis of FAARS coding between a dyad of raters

N=40		ICC				ICC	
NRS	Ratings	Count concrete	Count weak	PRS	Ratings	Count concrete	Count weak
Critical Scale	0.91	1	0.82	Warmth Scale	0.91	0.68	0.64
Critical item 1 behaviour	0.91	1	0.86	Warmth item 1 behaviour	0.64	0.32	0.46
Critical item 2 traits	0.67	1	0.33	Warmth item 2 traits	0.93	0.70	0.68
Critical item 3 relationship	1	1	1	Warmth item 3 relationship	0.84	0.46	0.74
Critical item 4 intentions	1	1	1	Warmth item 4 intentions	1	1	1
Critical item 5 conflict	1	1	1	Warmth item 5 love	0.89	0.81	0.58

Note. NRS = Negative relational scale, PRS = Positive relational scale, ICC = Intra class correlation.
All ICCs reached p<.05

However, count data was found to have a greater range, total count ICCs were approaching acceptability for warmth (.64 for weak & .68 for concrete) with critical counts again reflecting low frequency of use (.82 for weak & 1 for concrete). At item level the count reliability was lower ranging from .32-1; this poor performance may be attributable to the allocation of comments to different items such as behaviour or traits. Neonates' behaviour is less purposeful and more reflexive than older children and therefore the mothers' comments about it can be less clearly distinguished as referring to behaviour or traits. Count data is a more specific measure to employ than the rating scale which may be more reliable at item level as it also accommodates a coder's global view.

Summary

Coders had high inter-rater reliability for the PRS and NRS and individual item ratings were also within an acceptable range. This suggests that FMSSs can be consistently rated using the FAARS coding scheme in this novel population. Inter-rater reliability for count data for the NRS and PRS were moderate to high however, ICCs for counts at the item level were poor.

References

Bullock, B. M., & Dishion, T. J. (2007). Family processes and adolescent problem behavior. *Journal of the American Academy of Child & Adolescent Psychiatry*, *46*(3), 396–407. http://doi.org/10.1097/chi.0b013e31802d0b27

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Appendix 22: Factor Analysis of the FAARS Positive Relational Scale

Scale Reliability

The five-item positive rating scale (PRS), constituted of positivity about behaviour, traits, relationship with the target child, assumption of positive intentions and statements of love/care. The scale had an unacceptably low Cronbach's alpha of .35 indicating that the group of items were not reliably indicative of a single underlying construct in this investigation. The inter-item correlations further reflected this with non-significant associations between 'statements of love/care' and positivity about behaviours, traits and intentions. Additionally, 'reports of positive relationship' did not significantly correlate with positivity about traits and intentions. Consequently, an exploratory factor analysis was undertaken to identify if expressed warmth across the five items identified separate latent variables.

Assumptions Testing

The sample (N= 216) was deemed low but adequate for the analysis, exceeding 10-15 participants per variable (Field, 2013) with Kaiser-Meyer-Olkin measure of sampling adequacy marginally acceptable at 0.56. The Bartlett test of sphericity was significant ($\square^2$ (10) = 58.58, p< .001) with the correlation matrix containing at least one significant association between each variable ranging from .16 - .34. The diagonals of the anti-image correlation matrix were all greater than 0.5 indicating the inclusion of each variable. Inspection of the communalities revealed common variance across each variable, though all below 0.5, indicating a low proportion of shared variance.

Factor Analysis

An exploratory factor analysis was adopted because the primary purpose was to identify the maximum amount of common variance identified within latent variables. The eigenvalues showed that the first factor (1.57) explained 31.4% of variance and the second factor (1.17) 23.3% of variance with further eigenvalues falling below 1.0 and inspection of the scree plot indicating a levelling off of the curve after two factors.

The two factor solution, which explained 54.8% of the variance, was examined using an oblique rotation (direct oblimin). This rotation was adopted as it assumes relatedness between factors based upon theory. The final factor solution grouped positivity about infant's traits, behaviours and intentions on factor 1 and statements of love/care and positivity about the relationship on factor 2 (see Table 1).

Table 1

Factor loadings and communalities based on an exploratory factor analysis with oblique rotation for the PRS (N=216)

Variable	Factor loading		Communalities
	Factor 1: Positive comments	Factor 2: Positive relationship	
Positive regarding behaviour of TC	0.68		0.41
Positive regarding traits or personality of TC	0.25		0.07
Assumes or attributes positive intentions of TC	0.41		0.19
Reports positive relationship with TC		-0.49	0.30
Statements of love/caring toward TC		-0.70	0.43

Note. Factor loadings <.2 are suppressed

The solution had a correlation between factors of -.31 and all items had low loadings on the alternative factors. The trait variable had a factor loading of 0.25, below the recommended level of 0.3 however it was retained in the factor solution on theoretical grounds. Firstly, the shared variance of positivity about behaviour and traits was found to be stable in the sample from an earlier analysis of the mothers' FMSSs about their children at age 14 months. Furthermore, the proposed factor solution fits with the vast body of work which has been conducted in expressed emotion literature, where relationship and comments about behaviour or characteristics are often coded separately (Magana, 1986). The PRS was subsequently analysed as two factors of positive comments and positive relationship.

References

Field, A. P. (2013). *Discovering statistics using IBM SPSS statistics: (and sex and drugs and rock 'n' roll)*.

    Los Angeles: Sage.

Magana, A. (1986). A brief method for assessing expressed emotion in relatives of psychiatric patients.

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Appendix 23: Infant-Feeding Intention Question

For examination purposes only

Appendix 24: Infant-Feeding Questions

For examination purposes only

Appendix 25: Data Screening Procedures

Comparison of Participants versus Non-Participants

A comparison of women included in this investigation, with those in the original intensive sample who were not included, was conducted to determine sources of sampling bias. Women included in the analysis (n=216) were older (mean age 28.3) than the 100 non-participants (mean age 25.7), t = -3.51 (314), p = .001, and reported lower depressive symptomology (median score 8) than non-participants (median score 10), U = 8552, p = .004. There was no difference in the likelihood of women being prenatally allocated to high or low risk stratification on the basis of inter-partner psychological abuse (x^2 =1.23 (1), p = .27). The women included in the analysis were significantly more likely to have reported intention to breastfeed at recruitment (x^2 = 22.71 (1), p < .001). These differences suggest that women included in this investigation are not fully representative of the original intensive sample.

Data Screening and Assumptions Testing

The data was inspected for accuracy and cleaned; the prevalence of missing items within measures was low at under 5% and therefore no further investigation of missing data undertaken (Tabachnick & Fiddell, 2013). Continuous data were assessed for deviations from the assumptions of normality. Visual inspection of histograms (see Figures 1-8), probability and box plots revealed non-normal distribution for the Wechsler Test of Adult Reading (WTAR), new-born level of breastfeeding exclusivity, Edinburgh Postnatal Depression Scale (EPDS) and State-Trait Anxiety Inventory (STAI) at 20 week and 32 week gestation.
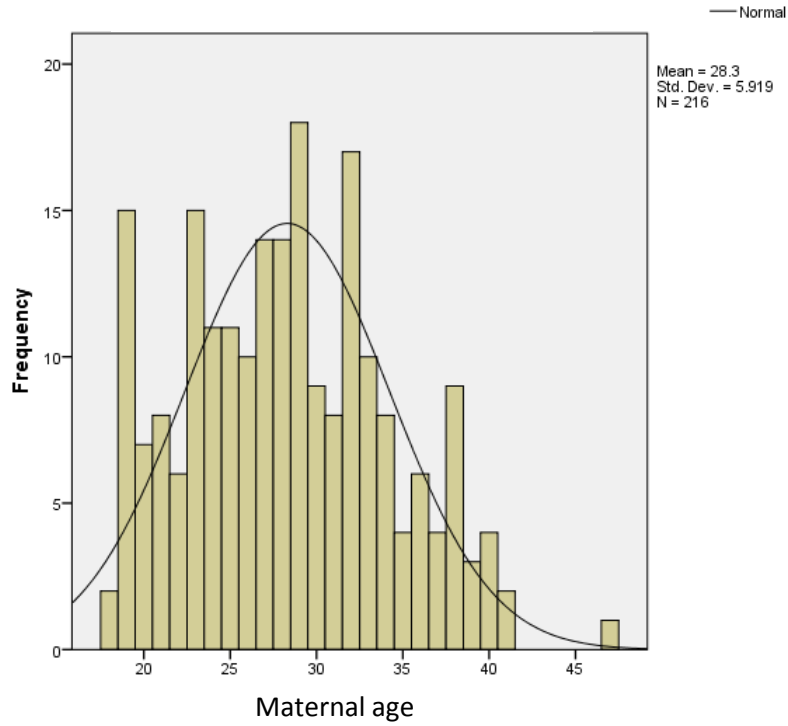
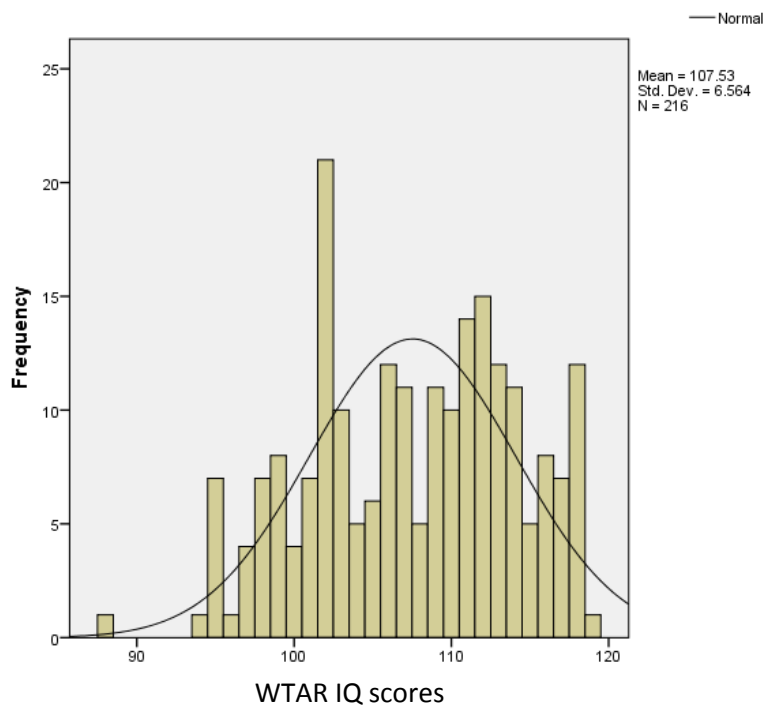*Figure 1*. The distribution of maternal age
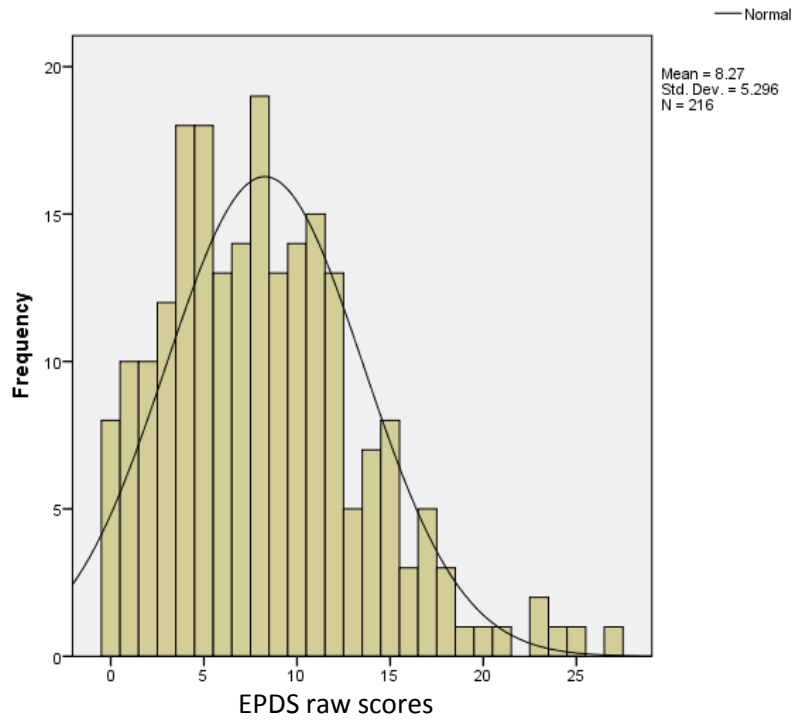

Figure 2. The distribution of WTAR scores

Figure 3. The distribution of 20 week EPDS scores

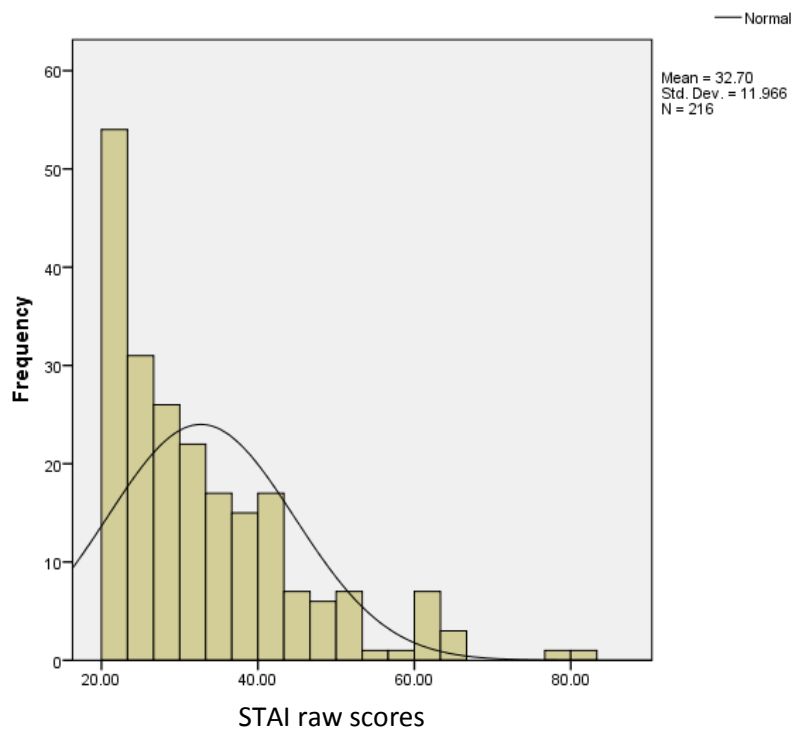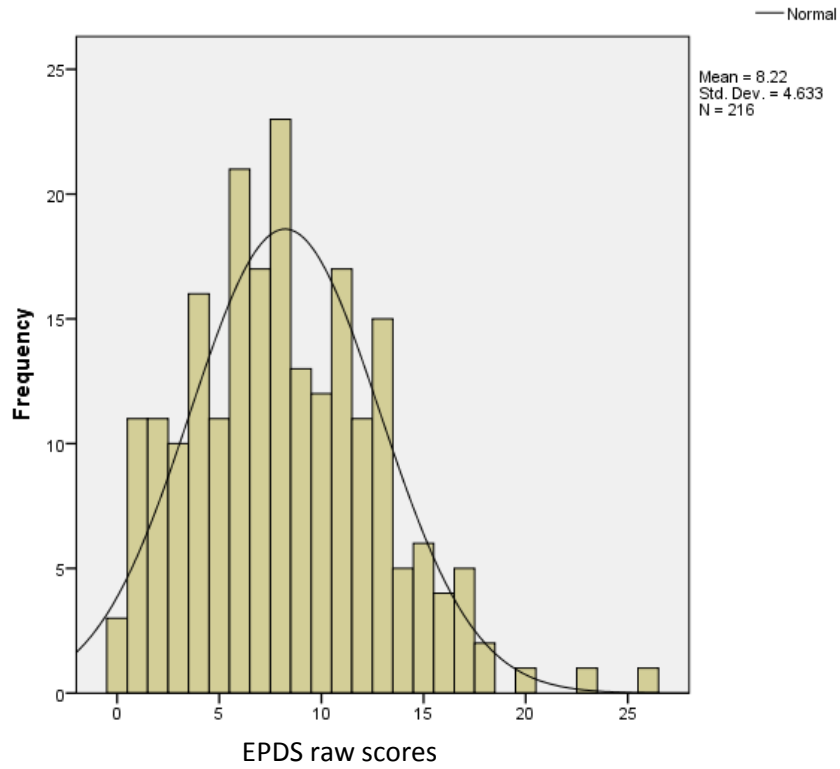*Figure 4*. The distribution of 20 week STAI scores

EPDS raw scores

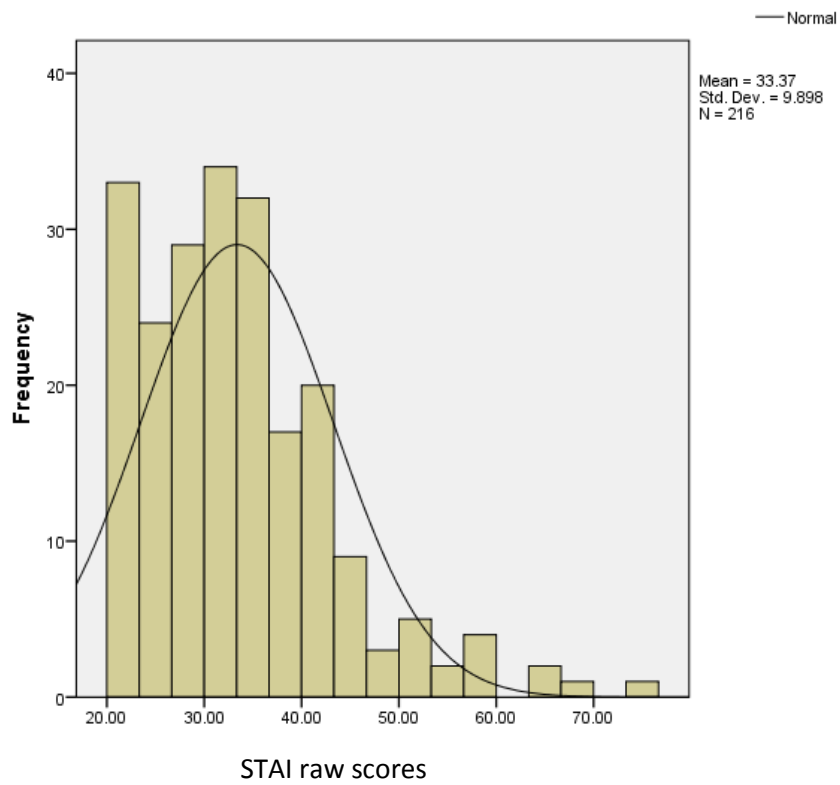*Figure 5*. The distribution of 32 week EPDS scores

STAI raw scores

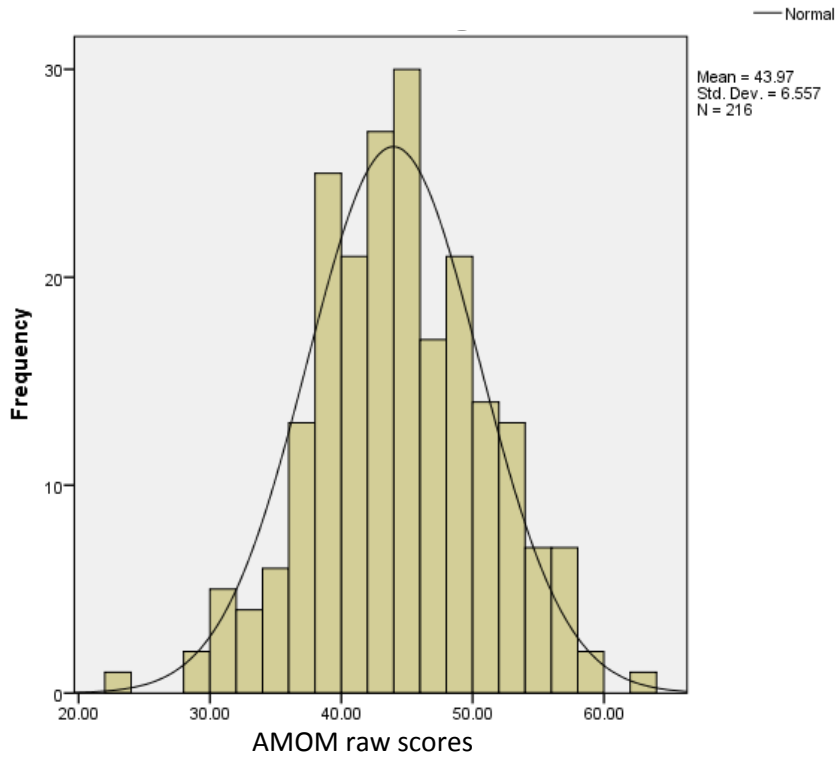*Figure 6*. The distribution of 32 week STAI scores

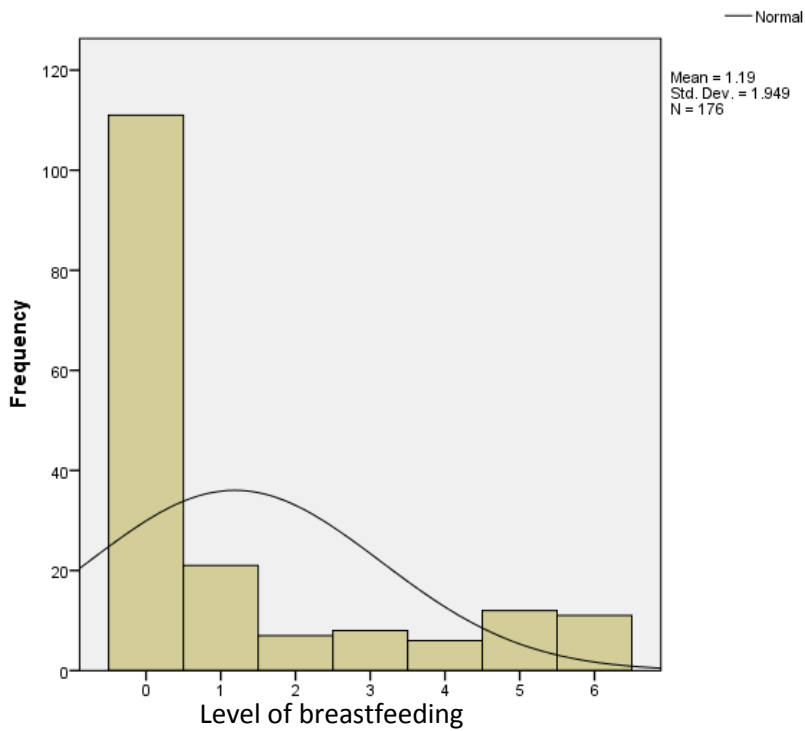*Figure 7*. The distribution of 32 week AMOM scores

Figure 8. The distribution of the level of breastfeeding at new-born

(0 mostly breastfeed to 6 mostly bottle-feed)

The EPDS and STAI had outliers, with small numbers of women reporting high levels of symptomology; however the removal of outliers from analyses did not help to normalise data so these were retained. All variables except the Antenatal Maternal Orientation Measure (AMOM) had significant Kolmogorov–Smirnov test statistics. The descriptive statistics including skew and kurtosis of variables are reported in Table 1.

Table 1

Descriptive statistics for continuous variables

Variable N=216	Mean	Std. dev	Min (scale)	Max (scale)	Skew Z score	Kurtosis Z score
WTAR	107.53	6.56	88 (55)	119 (145)	-1.43	-2.33*
Maternal age	28.3	5.92	18	47	1.71	-1.49
20 week EPDS	8.27	5.30	0 (0)	27 (30)	4.66*	2.03*
32 week EPDS	8.22	4.63	0 (0)	26 (30)	3.24*	1.26
20 week STAI	32.70	11.97	20 (20)	80 (80)	8.05*	5.14*
32 week STAI	33.37	9.90	20 (20)	76 (80)	7.16*	6.52*
AMOM	43.97	6.56	23 (0)	62 (66)	-0.36	-0.02
Level of breastfeeding [a]	1.19	1.95	0 (0)	6 (6)	8.06*	1.88

Note:. WTAR = Wechsler Test of Adult Reading, EPDS = Edinburgh Postnatal Depression Scale, STAI = State-Trait Anxiety Inventory, AMOM = Antenatal Maternal Orientation Measure.
[a] = n 176
* $p<.05$

Interval data of maternal age and predicted IQ from the WTAR were retained as untransformed variables in analyses to aid interpretation as parametric tests have been identified as robust with data which slightly deviates from the normal distribution (Hinton, 2004). Non-parametric bivariate tests were used for other non-normal variables. To support the stability of multivariate analyses, transformations were undertaken using SPSS (Log, square root) which were ineffective for EPDS, STAI and level of breastfeeding variables, consequently the STATA zero-skew facility was

utilised. In multivariate analyses, EPDS, STAI and level of breastfeeding variables' test statistics and p values are representative of transformed data.

Distribution of Continuous Data

The multicollinearity of variables was assessed by inspecting the correlation matrix which showed that 20 and 32 week breastfeeding intention was highly correlated at $r_\varphi = .85$; consequently only one time-point was retained in each multivariate model. Furthermore, 20 and 32 week EPDS and STAI were correlated highly, across time, EPDS $r_s = .68$, STAI $r_s = .55$; EPDS and STAI at 20 weeks $r_s = .66$, and 32 weeks $r_s = .61$. Therefore the EPDS and STAI at a single time-point were entered into separate multivariate models.

Multivariate Testing

Binary logistic regressions were undertaken for multivariate analyses; the chi-square assumptions of expected cell frequencies were valid for all of the discrete variables. For all of the models reported, Hosmer and Lemeshow tests were non-significant indicating a good fit and none of the predictor standard errors showed inflated values.

References

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Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics.* Boston: Pearson.