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Does body image influence the relationship between body weight and breastfeeding maintenance in new mothers?

--Manuscript Draft--

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Keywords:	Breastfeeding Maintenance; Health behaviour; Maternal Obesity; body image; psychological distress; Longitudinal study
Manuscript Classifications:	Obesity; Diet/nutrition; Social cognition models
Abstract:	<p>Objectives. Obese women have lower breastfeeding initiation and maintenance than healthy weight women. Research generally focuses on biomedical explanations for these differences. The impact of psychosocial factors, including women's post-childbirth well-being and body image cognitions in relation to breastfeeding are less well understood. We aimed to investigate women's body image after childbirth in hospital, and 6-8 weeks later, studying the impact of body image and psychological distress on breastfeeding maintenance at 6-8 weeks, comparing obese and healthy weight women.</p> <p>Design. Longitudinal semi-structured questionnaire survey.</p> <p>Methods. Demographic and biomedical factors were measured around childbirth. Body image and psychological distress were assessed within 72 hours of birth and by postal questionnaire at 6-8 weeks, for 70 obese and 70 healthy weight women initiating either exclusive (breastmilk only) breastfeeding or mixed feeding (with formula milk) in hospital. Breastfeeding status was re-assessed at 6-8 weeks.</p> <p>Results. Obese women were less likely to exclusively breastfeed in hospital and maintain breastfeeding to 6-8 weeks. Although body satisfaction was lower overall in obese women, all women had relatively low body image satisfaction around childbirth, reducing further by 6-8 weeks postnatal. Better body image was related to maintaining breastfeeding at 6-8 weeks, and lower postnatal psychological distress, although education status was the most important factor in the final model. Body image mediated the relationship between weight and breastfeeding maintenance.</p> <p>Conclusions. Health professionals should consider body satisfaction when discussing breastfeeding. Normalising post-childbirth bodies, encouraging women to focus on function over form may support breastfeeding for all women.</p>
Additional Information:	
Question	Response
If you have any potentially competing interests to declare, please enter them in the box below. If you have no interests to declare, please enter 'none'. Please declare any financial relationships (such	none

<p>as employment, consultancies, stock ownership or options, honoraria, patents, paid expert testimony) or any personal relationships which could be perceived to undermine the credibility of your research. By conflict of interest, we are referring to cases where professional judgment in relation to the research, or the welfare of research participants, may be influenced by another interest, such as financial gain or personal relationships.</p>	
<p>Does this submission have any links or overlap with any other submitted or published manuscripts, for this or any other publication? (For example; as part of a long-term project, using a shared data set, a response to, or extension of, earlier work.) If yes, please give brief details. If no, please enter 'none'. Any overlap not declared and later discovered will result in the manuscript being withdrawn from consideration.</p>	<p>none</p>
<p>Please specify the word count of your manuscript (excluding the abstract, tables, figures and references).</p>	<p>Article, 4964</p>
<p>Do you use Twitter for academic purposes? (If you do and your paper is accepted, we will 'mention' you when we share a link to the online article.)</p>	<p>yes</p>

Body Image and Breastfeeding Maintenance

Response to Reviewer #2:

Reviewer: This is the second time I have reviewed this paper, and it has improved since the first version. Removing the TPB variables has meant a clearer focus. However, I still feel that the paper could be considerably sharper. The introduction especially seems very convoluted, and it is really hard to understand where you are taking the reader. It is very odd for example that you don't raise the difference in breastfeeding rates between obese and health weight women until page 5.

Response: In response to these comments about focus we have changed the introduction and discussion quite a lot to re-focus on the RQs. This means there are lots of tracked changes so I'm sending a clean copy. Line numbers therefore refer to this new copy.

We have changed the introduction to re-order the different components - the comparison of obese/HW women's breastfeeding rates appears on page 3 , lines 50-61.

Reviewer: It is also not really clear what is your primary research question? Are you interested in body image as a potential mediator of the relationship between body weight and breastfeeding? OR are you exploring the relationship between body image and breastfeeding more generally, and comparing health weight and obese women to see if this relationship changes (i.e. is body weight a moderator of relationship between body image and breastfeeding? Your research questions indicate the former, but the introduction, aims and title seems to suggest the latter. I think a sharper focus on one primary research question, addressed first in the results and discussion, and introduced more succinctly in the introduction would improve this paper.

Response: I have re-ordered the introduction as above and set out the primary and secondary research questions in the introduction (page 5-6). The primary RQ is therefore: Does body image explain the relationship between body weight and breastfeeding maintenance at 6-8 weeks postnatal? I have retained the section on changes in body image between time 1 and 2, and using comparative norms (RQ iv, p6)

Reviewer:

P2 L27: "maintain breastfeeding for the recommended periods" - which periods?

Response: Changed and re-worded this to clarify— see page , lines 35-39

P2: L32-33 you refer to government policies but your citations are not government policies

Response: Changed citations and reworded page 2, lines 29-39

Reviewer:

Page 3: L53-55: " since there are links between lower SES and overweight and obesity..." this seems a very odd statement particularly as you have not yet raised association between body weight and breastfeeding.

The introduction has been reordered to achieve a better flow of argument (on page 2:lines 42-28)

Reviewer:

P16 L348: remove the reference to a trend. Your result is either significant or it is not. I

would remove and discussion of this as if it was significant too.

This has been removed here and in the discussion.

Reviewer:

P16: L350 : a mediator of breastfeeding and? is there something missing here?

Response: Amended

Reviewer:

P18 - L392-395: didn't appearance evaluation ratings also drop? would that mean that women are feeling less concerned about their appearance?

Response: Appearance evaluation rating did drop overall but this is about how they rate their appearance –appearance orientation is about how concerned they are – which didn't change from Time 1 to Time 2.

Reviewer: P18 L410-411: remove sentence about body satisfaction - not significant

Response: this has been removed

Reviewer: P19 L423-427. Although I agree with what the author is saying - many women do struggle - I think it is also important that we are careful not to paint breastfeeding as only a negative experience. For many it can be a very positive and fulfilling experience. Could there even be a role for breastfeeding in improving a women's view of her body, and being proud of what it can do?

Response: This is a good point – and I would much rather present a more balanced view - have changed wording of several bits throughout to be less negative, including page 18, lines 400-407.

Additional Point:

We changed RQ (iii) (page 6) to refer to both mediation and moderation as this provides a more complete explanation of explanatory variables in the relationship between weight and breastfeeding. The moderation analysis is reported on page 13, reproduced below:

'To assess moderation effects we included product terms between weight status (healthy weight/obese) and body satisfaction, appearance orientation, and overweight preoccupation in a final block. This model was non-significant, (Nagelkerke $R^2 = .21$, n.s.) and no interaction terms were significant, suggesting no moderation effect. '

Does body image influence the relationship between body weight and breastfeeding maintenance in new mothers?

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Statement of Contribution: Does body image influence the relationship between body weight and breastfeeding maintenance in new mothers?

What is already known on this subject?

Obesity can negatively affect breastfeeding initiation and maintenance, but there is little information about how psychosocial factors affect this relationship. Body image may be an important factor, but has not been studied in relation to breastfeeding maintenance.

What does this study add?

- This paper examines the influence of body image on obese and healthy-weight women's breastfeeding maintenance at 6-8 weeks.
- Different aspects of body image mediated but did not moderate the relationship between weight status and breastfeeding maintenance, but in multivariate regression, maternal education level was the most significant predictor.
- Obese women had poorer body image and were less likely to maintain breastfeeding, however, for all women, body image became more negative in this postpartum period.
- Interventions should normalise positive aspects of women's postnatal bodies, including function rather than form. Addressing body concerns could encourage new mothers to maintain breastfeeding, irrespective of weight status.

Body Image and Breastfeeding Maintenance

1 **Abstract**

2 **Objectives.** Obese women have lower breastfeeding initiation and maintenance rates than
3 healthy weight women. Research generally focuses on biomedical explanations for this.
4 Psychosocial factors, including body image and well-being after childbirth are less well
5 understood as predictors of breastfeeding. In obese and healthy weight women, we
6 investigated changes in body image between 72 hours post-delivery and 6-8 weeks post-
7 partum, studying how women's body image related to breastfeeding initiation and
8 maintenance. We also investigated how psychological distress was related to body image.

9 **Design.** Longitudinal semi-structured questionnaire survey.

10 **Methods.** Body image and psychological distress were assessed within 72 hours of birth and
11 by postal questionnaire at 6-8 weeks, for 70 obese and 70 healthy weight women initiating
12 exclusive (breastmilk only) breastfeeding or mixed feeding (with formula milk) in hospital.
13 Breastfeeding was re-assessed at 6-8 weeks.

14 **Results.** Obese women were less likely to exclusively breastfeed in hospital and maintain
15 breastfeeding to 6-8 weeks. Better body image was related to maintaining breastfeeding
16 and to lower postnatal psychological distress for all women, but education level was the
17 most significant predictor of maintenance in multivariate regression including body image
18 and weight status. Body image mediated, but did not moderate the relationship between
19 weight and breastfeeding maintenance. Body image was lower overall in obese women, but
20 all women had low body image satisfaction around childbirth, reducing further at 6-8 weeks.

21 **Conclusions.** Health professionals should consider women's body image when discussing
22 breastfeeding. A focus on breast function over form may support breastfeeding for all
23 women. (247)

24 **Introduction**

25

26 *Breastfeeding promotes health*

27

28 There is clear evidence that breastfeeding is beneficial for the health of mother and

29 infant (Victora *et al.*, 2016). UK breastfeeding rates compare poorly with other western

30 countries (Cai, Wardlaw & Brown, 2012). Initiation rates in Scotland have remained largely

31 static over the past 25 years (Information Statistics Division (ISD), Scotland, 2015), and the

32 most recent UK Infant Feeding Survey reports prevalence of maintaining ‘any breastfeeding’

33 (including breastfeeding supplemented with formula milk) falling sharply from 81% at birth

34 to 69% at 1 week, 55% at 6 weeks and 34% at 6 months (McAndrew, Thompson, Fellows,

35 Large, Speed & Renfrew, 2012). International recommendations suggest ‘exclusive’

36 breastfeeding (baby receives only breastmilk and no other fluids) should be maintained for

37 at least six months (WHO 2009; Baby Friendly Health Initiative 2012), and these policies are

38 promoted in UK hospitals ante-natally, around childbirth and post-natally (Renfrew,

39 Wallace, D’Souza, McCormick, Spiby & Dyson 2005). In reality, although many women

40 intend to breastfeed and initiate breastfeeding at birth, it is often terminated early and not

41 maintained for this recommended period (Stuebe & Bonuck 2011; Hoddinott, Craig, Britten

42 & McInnes, 2012). There are strong demographic differences in breastfeeding rates. In

43 western countries, younger women, white ethnic groups, and those with lower socio-

44 economic status (SES) are less likely to initiate and maintain breastfeeding (Barnes, Stein,

45 Smith & Pollock 1997; Lawton, Ashley, Dawson, Waiblinger & Conner, 2012; McAndrew *et*

46 *al.* 2012; Oakley, Renfrew, Kurinczuk & Quigley, 2013). Lower SES is also linked with more

47 overweight, particularly in women (Sassi, Devaux, Cecchini & Rusticelli, 2009; Pampel,

48 Denney & Krueger, 2012).

49 *Weight status and breastfeeding*

50 Women who are overweight or obese are less likely to initiate and maintain
51 breastfeeding than healthy weight women (Amir & Donath, 2007; Wojicki 2011; Thompson
52 *et al.*, 2012). A French study found that obese women were more likely than healthy weight
53 women to introduce supplementary formula milk early (Mok, Multon, Piguel, Barroso &
54 Gua, 2008), and obese first time mothers in Denmark were twice as likely to stop exclusive
55 breastfeeding than healthy weight women (Kronborg, Vaeth & Rasmussen, 2012). There are
56 several potential influences. Obese women may have more physical difficulties, for
57 example, successfully latching their baby onto the breast or maintaining effective
58 positioning, or problems with delayed onset of lactation (Hilson, Rasmussen & Kjolhede,
59 2004). Additionally, caesarean section, more common in obese women (Leddy, Power &
60 Schulkin, 2008; Denison *et al.*, 2014) is associated with early introduction of formula milk
61 and early breastfeeding cessation (Schmied, Duff, Dahlen, Mills & Kolt, 2011).

62 Although we can identify demographic and clinical factors linked with lower
63 breastfeeding rates in obese women, psychosocial influences may offer additional
64 explanations for these differences, and are also potentially modifiable (Michie *et al.*, 2013).
65 Social cognitive models, including the Theory of Planned Behaviour (Ajzen 1991) suggest
66 breastfeeding attitudes and social norms are influential (Swanson & Power, 2004; Swanson,
67 Power, Carter & Shepherd, 2006; Foulkes, Dundas & Denison, 2008; McMillan, Conner,
68 Green, Dyson, Renfrew & Wooldridge, 2009; Lawton *et al.*, 2012), but generally do not
69 account for weight status. Maternal identity (Virden, 1988; Marshall, Godfrey & Renfrew,
70 2007), and cultural norms also affect breastfeeding initiation and maintenance (Steube &
71 Bonuck, 2011; Scott *et al.*, 2015), and increasing self-efficacy (Bandura 1986) can improve
72 women's breastfeeding duration (Dennis, 2006; Swanson, Nicol, McInnes, Cheyne, Mactier
73 & Callander, 2012; Keeley, Lawton, Swanson & Denison, 2015).

74 *Body Image*

75 Women's body image (Grogan, 2007) may relate to both breastfeeding and body
76 weight, but has received little research attention in this context. Pregnancy, childbirth and
77 the postnatal period are characterised by intense changes to women's bodies (Hodgkinson,
78 Smith & Wittowski, 2014; Orbach & Ruben, 2014), encompassing physical appearance and
79 bodily functions, including breasts and breastfeeding. Women report satisfaction or
80 dissatisfaction regarding their weight, shape, and evaluation of different body areas during
81 pregnancy and after childbirth (Abraham, King & Llewellyn-Jones, 1994; Fern, Buckley &
82 Grogan, 2014). For example, women may be concerned about the impact of pregnancy and
83 breastfeeding on their breast shape and the shift in focus from form (appearance, the breast
84 as a sexual object) to function (desire or ability to breastfeed) during this period, (Office of
85 the Surgeon General (US), 2011). Alternatively, breastfeeding may increase or 'protect'
86 against, body image dissatisfaction (Huang, Wang & Chen, 2004), and breastfeeding women
87 may be less concerned about the 'thin ideal' postnatally (Fern *et al*, 2012). There is evidence
88 of the benefits of breastfeeding for postnatal weight loss (Bobrow, Quigley, Green, Reeves &
89 Beral, 2009), although this evidence is less clear for morbidly obese women (Baker,
90 Gamborg, Heitmann, Lissner, Sørensen & Rasmussen, 2008). However, women may also be
91 influenced by lay beliefs and contradictory social media posts (e.g. Daily Mail, 2014), which
92 are critical of breastfeeding, particularly in social contexts. One US study found body
93 dissatisfaction mediated, or explained how obesity reduced breastfeeding duration (Hauff
94 & Demerath, 2012). However wider aspects of body image, including evaluation of external
95 appearance, self-evaluation, and weight perception may also be relevant (Cash, 2000)
96 Alternatively body image may moderate (affect the strength of) the effect of weight on
97 duration. Women can experience social disapproval for breastfeeding (Stewart-Knox,

98 Gardiner & Wright, 2003; Mok *et al.*, 2008), and negative body image may increase women's
99 experience of embarrassment, becoming a disincentive to breastfeeding in social contexts.
100 Obese women may therefore face 'double' disapproval, for being both overweight and
101 breastfeeding, with negative psychological consequences.

102 *Psychological Well-being*

103 Women's psychological well-being during pregnancy, childbirth and postpartum
104 influences breastfeeding initiation (Barnes *et al.*, 1997) and maintenance (Zanardo *et al.*,
105 2014). Stress, anxiety and depression can characterise the perinatal period for some
106 women, and are related to more perceived difficulty breastfeeding and earlier cessation
107 (Thome, Alder & Ramel, 2006). Obesity has also been associated with stress and distress
108 post-natally, including depression and anxiety (Mina, Denison, Forbes, Stirrat, Norman &
109 Reynolds, 2015), and 'embodied' cognitions, defined as cognitive interpretations of physical
110 state or bodily functions, may be influential as either positive or negative cues (Meier,
111 Schnall, Schwarz, & Bargh, 2012; Sheeran, Gollwitzer & Bargh, 2013). Negative 'embodied'
112 emotional responses to physical sensations of breastfeeding (such as suckling or nipple pain)
113 have also been related to postnatal depression (Watkinson, Murray & Simpson, 2016).

114 **Aims**

115 Body image is influenced by women's weight status, and weight status influences
116 breastfeeding, but we do not fully understand how body image influences breastfeeding
117 maintenance, and whether this varies in obese compared with healthy weight women. We
118 investigated this relationship, considering mediation (how) and moderation (for whom)
119 effects (MacKinnon & Leucken, 2008) and whether body image changed in relation to
120 weight status in the period from immediately post-childbirth to 6-8 weeks later. The primary
121 research question was:

122 (i) Does body image explain the relationship between body weight and
123 breastfeeding maintenance at 6-8 weeks postnatal?

124 Secondary research questions were:

125 (ii) How does body weight relate to socio-demographic and biomedical predictors of
126 breastfeeding (exclusive vs. mixed feeding) in hospital and maintenance (any
127 breastfeeding) at 6-8 weeks?

128 (iii) Does body image mediate or moderate the effect of weight status on
129 breastfeeding maintenance?

130 (iv) How do aspects of body image change, comparing obese and healthy weight
131 from childbirth to 6-8 weeks postnatal?

132 (v) How is postnatal psychological distress related to body image, and to women's
133 breastfeeding maintenance?

134

135 **Participants and Methods**

136 This was a longitudinal questionnaire-based study. We compared healthy weight
137 (defined as body mass index (BMI) $18.5 < 25 \text{ kg/m}^2$) and obese women (defined as BMI
138 $> 30 \text{ kg/m}^2$). Recruitment was by a research midwife from January 2011 to March 2013.

139 Women were eligible for inclusion if they had breastfed at first feed, given birth to a single

140 baby at > 37 weeks gestation and had a BMI at any stage of pregnancy of either

141 $18.5 < 25 \text{ kg/m}^2$ or $> 30 \text{ kg/m}^2$ (from maternal records). Women were ineligible if they were

142 < 18 years old, were not being discharged home with their baby, or were unable to give

143 informed consent. Women whose baby is admitted to a neonatal unit are likely to face

144 additional challenges in relation to postnatal recovery and in initiating breastfeeding, so

145 were not included in this study. We specifically recruited equal numbers of 'healthy weight'
146 and 'obese weight' women to explore predictors of breast-feeding maintenance in these
147 groups. Although it is of interest to study underweight women, we wanted to focus on how
148 body image affected breastfeeding for obese and 'healthy' weight women in this research.
149 Eligible women were approached on the postnatal ward within 72 hours of giving birth.
150 Following informed consent, women completed a questionnaire prior to hospital discharge
151 (Time 1) and a second postal questionnaire at 6-8 weeks postpartum (Time 2). This time
152 point is selected in many studies as a period when women have established some routine in
153 their home/family context, and some stability in their infant feeding behaviour. The project
154 gained ethical approval from the Lothian NHS Research Ethics Committee (Ref
155 10/S1102/55).

156

157 **Sample Size.**

158

159 From previous research, we expected fewer obese women to breastfeed at 6-8
160 weeks postnatal, but did not know what effect size to expect in relation to body image.
161 Studies using socio-cognitive predictors of health behaviours generally show a medium
162 effect size using multiple regression to predict behaviour (Francis *et al.*, 2004). Using
163 G*Power, for an effect size of $r = .3$, power .80 and alpha .05, a sample of approximately 80
164 at follow-up (Time 2) (40 per group) is required (Faul, Erdfelder, Lang, & Buchner, 2007).
165 Based on a predicted response rate of 50-60% at Time 2, we aimed to recruit around 140
166 women at Time 1 (70 per group) which would provide sufficient power for follow-up
167 analysis.

168 **Measures**

169 *Maternal demographics and Biomedical variables*

170 Women's education level has repeatedly been shown to influence breastfeeding
171 rates (Barnes *et al.* 1997; McAndrew *et al.* 2012) and is a useful proxy for SES. We measured
172 highest level of education, on a 5 point scale from 0=none to 4 = postgraduate qualification.
173 Smoking status (yes/no) was assessed as a potential predictor of breastfeeding
174 maintenance. Mode of delivery (spontaneous vertex delivery (SVD), instrumental vaginal
175 delivery (forceps/ventouse), caesarean section (emergency/elective) was collected from
176 maternal records, and collapsed into 'other' (SVD and instrumental vaginal delivery) vs
177 'caesarean section' for analysis.

178 *Breastfeeding status*

179 Information about maternal breastfeeding behaviour was collected at Time 1 and 2.

180 Since 'exclusive' breastfeeding for the first 6 months is recommended (WHO 2009), we
181 classified this behaviour at Time 1 as:

182 i) Exclusive breastfeeding: 'No other liquids or solids are given to my baby apart
183 from breastmilk',

184 ii) Mixed feeding: 'My baby receives both breastmilk and formula milk'.

185 To reflect variation in breastfeeding maintenance, we added a third category at Time 2
186 (6-8 weeks):

187 iii) Exclusive formula feeding: 'My baby no longer receives breastfeeds or
188 breastmilk. I am currently feeding my baby with formula milk'.

189 For analysis we developed a dichotomous variable to measure breastfeeding
190 maintenance, representing 'any' breastfeeding (exclusive or mixed) vs. none, i.e. 'only'
191 formula feeding at Time 2.

192 *Psychosocial Measures*

193 Psychosocial measures were collected at both time points.

194 **Body Image**

195 The concept of 'body image' captures a range of attitudes towards the physical self.
196 The experience of childbirth and becoming a mother presents a significant challenge to
197 women's physical self-concept (Lupton, 2012). We were interested in women's appraisals of
198 their body (evaluations, affective reactions) and overall importance of (investment in) their
199 appearance, comparing women's attitudes in the immediate postnatal period with 6-8
200 weeks later, and in relation to breastfeeding maintenance. We used a short version of a
201 previously validated measure, which assesses 'trait' (long-term, stable, schema-based)
202 appraisal, and 'state' (current, context dependent appraisals) aspects of body image to
203 reflect women's reactions to the challenges of childbirth and breastfeeding. The MBSRQ
204 (Multidimensional Body-Self Relations Questionnaire; Cash, 2000; Cash, Fleming, Alindogan,
205 Steadman & Whitehead, 2002) investigates appearance related concerns. Rather than using
206 a total score, subscales representing different aspects of body image were developed by
207 factor analysis of data from USA studies. All items are scored on 5 point scales from 1
208 'strongly disagree' to 5 'strongly agree'. Item means were calculated by dividing by the
209 number of items in the subscale, according to manual instructions (Cash 2000). Cronbach
210 alpha values given below are from the current study (Time 1). The following appearance-
211 related subscales were included:

212 **Appearance Evaluation (7 Items):** Feelings of physical attractiveness or unattractiveness
213 and satisfaction or dissatisfaction with physical appearance. High scores reflect feeling
214 mostly positive and satisfied with their appearance ($\alpha = .79$).

215 **Appearance Orientation (12 items):** Measures the importance of appearance. High scorers
216 pay more attention towards their appearance ($\alpha = .86$).

217 **Body Areas Satisfaction Scale (9 items):** This measures satisfaction with specific areas of the
218 body: face (features and complexion), upper body (including breasts, arms and shoulders),
219 hair (colour, thickness, texture), lower body (hips, thighs, buttocks, legs), and mid-body
220 (waist, stomach), in addition to muscle tone, weight, height and overall appearance. Higher
221 scores suggest overall body satisfaction ($\alpha = .82$).

222 **Overweight Preoccupation (4 items):** Measures anxiety about weight, vigilance, dieting, and
223 eating restraint. Higher scores indicate more weight anxiety ($\alpha = .79$).

224 **Self-classified weight (2 items):** Reflects how weight is perceived by self and others from
225 very underweight to very overweight. High scores reflect more overweight ($\alpha = .93$).

226 **Psychological Distress:** *Psychological distress* was measured using the General Health
227 Questionnaire-12 form (GHQ) (Goldberg & Williams, 1988) total score. It has twelve
228 questions, assessing general affect, depressive and anxiety symptoms and sleep disturbance
229 over the last four weeks. Interpretation is based on a four point Likert scale scored 0= 'not at
230 all' to 3='much more than usual'. A cut-off of 11/12 indicates psychological distress requiring
231 therapeutic intervention (Goldberg *et al.*, 1997) ($\alpha = .75$).

232 **Analysis**

233 We examined the distribution of study variables to check for non-normal distributions,
234 outliers and missing data. We investigated breastfeeding differences between obese vs.
235 healthy weight women using Chi square tests. Effect sizes were assessed using partial eta

236 squared. Although body image is generally stable over time, childbirth and initiating
237 breastfeeding are uniquely challenging embodied events, so it was important to consider
238 whether body image scores at Time 1 or Time 2 were likely to be best predictors of
239 breastfeeding maintenance at 6-8 weeks. We reasoned that Time 1 in hospital was unlikely
240 to provide a realistic 'baseline' since women's perception of their bodies at this time may be
241 influenced by extreme emotions, cognitions and physical sensations such as pain from an
242 operative delivery, and/or pleasure due to close contact with their baby. Time 2
243 psychosocial variables were therefore used in analysis as more proximal and reliable
244 predictors of breastfeeding maintenance at 6-8 weeks. Significant Pearson correlations
245 directed selection of potential predictor variables for logistic regression analysis with
246 'breastfeeding (or not) at 6 weeks' as the binary dependent variable. Mediation (Baron &
247 Kenny, 1986) was investigated using logistic regression and bootstrapping techniques
248 (Preacher & Hayes 2008). Indirect effects were investigated using bias corrected estimates
249 (BCa) of confidence intervals at 95% with 1000 bootstrap samples (Hayes, 2009).
250 Moderation effects were investigated in regression by creating product terms of relevant
251 variables and including as a final block (Baron & Kenny, 1986). Finally, repeated measures
252 ANOVAs were calculated to investigate changes in body image and psychological distress
253 from Time 1 to Time 2 with weight status as between subjects factor, and time within
254 subjects.

255 **Results**

256

257 *Demographics*

258 140 participants were recruited (n=70 healthy weight and n=70 obese). The overall response
259 rate at follow-up was 84%, (n= 117) with no difference in response rates between healthy
260 weight and obese women (86% vs 81%, respectively, p=0.65).

261 Healthy weight women were more likely than obese women to be exclusively breastfeeding
262 at recruitment at Time 1 (p=0.018), and to have maintained exclusive or 'mixed'
263 breastfeeding at Time 2, (p=0.052) as shown in Table 1.

264 TABLE 1 ABOUT HERE

265

266 Participant demographic and clinical information is presented in Table 2. There was
267 no difference in age, parity, baby's weight, baby's gender, or smoking status between
268 healthy weight and obese women. Overall, 66 (47%) women had a degree and 36 (26%)
269 women had a postgraduate qualification, and obese women had lower levels of education.

270 TABLE 2 ABOUT HERE

271

272 Obese women were more likely to give birth by caesarean section (39% compared to 16%).

273 Women who had a caesarean section were less likely to be exclusively breastfeeding at Time
274 1 (26, 68%) compared with those who had vaginal delivery (87, 85%), $\chi^2(1) = 5.06, p=.03$.

275 Mode of delivery was not related to breastfeeding maintenance at Time 2.

276

277 *Body Image, Weight status and Breastfeeding Maintenance*

278

279 Correlations between breastfeeding maintenance at 6-8 weeks, weight status, body image

280 and psychological distress at Time 2, are shown in Table 3. Education level and delivery

281 method (vaginal vs. caesarean) were included as potential covariates. Body image variables

282 were positively or negatively inter-correlated as expected. Appearance evaluation and body

283 satisfaction were highly inter-correlated ($r=.83$). After exploratory analyses we excluded
284 'appearance evaluation' from further regression analysis. Psychological distress was related
285 to less breastfeeding maintenance, lower appearance evaluation and body satisfaction, and
286 higher weight self-classification.

287 TABLE 3 ABOUT HERE

288

289 We used logistic regression to predict breastfeeding at 6-8 weeks. A model including only
290 weight status (Nagelkerke $R^2 = .06$, $p=.03$; Wald 4.42, $p=.035$) was significant. Adding four
291 body image variables (excluding appearance evaluation) increased variance predicted by
292 14% (Nagelkerke $R^2 = .20$), with body satisfaction being a significant predictor ($B=1.7$ (SE.60),
293 Wald =7.98, $p=.005$). To assess moderation effects we included interactions (product
294 terms) of weight status (healthy weight/obese) and body satisfaction, appearance
295 orientation, overweight preoccupation and self-classified weight in a final block. This model
296 was non-significant, (Nagelkerke $R^2 = .21$, n.s) suggesting no moderation effect.

297

298 Building on this in a more comprehensive model, we included weight status (healthy
299 weight/obese) (Model 1), education level and delivery method (Model 2), Time 2 body
300 image variables (Model 3), and Time 2 psychological distress (Model 4), shown in Table 4.

301 TABLE 4 ABOUT HERE

302

303 Weight category significantly predicted breastfeeding maintenance at 6-8 weeks ($p=.03$),
304 but became non-significant in subsequent models with education level, four body image
305 variables, and psychological distress included. Body image variables predicted an additional

306 9% of variance. The final model was significant (predicting 31% of variance, $p < .001$).

307 Women's education level was the only significant predictor in the final model.

308

309 As body satisfaction had previously been identified as a mediator of breastfeeding (Hauff &

310 Demerath, 2012) we tested Time 2 body image variables as potential mediators of the

311 relationship between weight status and breastfeeding maintenance at 6-8 weeks (Baron &

312 Kenny 1986). Breastfeeding outcome (any breastfeeding vs no breastfeeding) was the

313 dependent variable in separate logistic regression analyses with weight status entered first,

314 followed by the potential mediator, using bootstrapping (BCa95%CI) to evaluate effects

315 (Table 5).

316 TABLE 5 ABOUT HERE

317

318 Weight status was a significant predictor in model 1, but became non-significant with

319 appearance evaluation, body satisfaction, overweight preoccupation and weight self-

320 classification, suggesting partial mediation effects of these variables.

321

322 *Changes in Body Image and Psychological Distress after Childbirth*

323 We considered how body image changed from Time 1 to Time 2 for obese and healthy

324 weight women. Table 6 shows mean body image scores at both time points for MBSRQ

325 components comparing healthy weight and obese women.

326 TABLE 6 ABOUT HERE

327

328 Obese women had poorer body image at both time points, in relation to *appearance*

329 *evaluation* and body satisfaction. Obese women recorded more *overweight preoccupation*

330 and higher weight *self-classification* with medium to large effects (partial η^2). There was
331 no difference, or change over time in *appearance orientation*.
332 *Appearance evaluation* and *body satisfaction* were significantly lower, irrespective of
333 weight status at Time 2. Interactions (between weight status and time) were not significant.
334 *Overweight preoccupation* increased significantly over time for both healthy weight and
335 obese women, with no significant interaction effect.
336 *Self-classified weight* did not change over time, however there was a significant interaction
337 effect, whereby healthy weight women experienced a larger perceived increase between
338 Time 1 and Time 2 ($F(1,115) = 4.37, p = .035, \eta^2 = .04$).
339 We compared mean values for each of the MBSRQ subscales from the total sample at both
340 time points with the published norms for US females aged 15 and over (Cash 2000), using
341 one-sample t-tests, as shown in Table 6.
342 Women's *appearance evaluation*, *appearance orientation* and *overweight preoccupation*,
343 were significantly lower (for both healthy weight and obese women) in our sample
344 compared with norms (all $p < .001$). There was no difference in *body satisfaction*, or *weight*
345 *self-classification* at Time 1 however, obese women had lower *body satisfaction* and higher
346 *weight self-classification* than norms at Time 2.
347 *Psychological Distress (GHQ)*
348 There was no difference in psychological distress between obese and healthy weight
349 women, or significant change in scores between Time 1 and Time 2, and no significant
350 interaction. However, mean scores for both groups (at both time points) were close to the
351 suggested 11/12 cut-off (Goldberg *et al.*, 1997) indicating 'caseness' or psychological
352 distress requiring intervention. We compared our Time 1 and Time 2 GHQ data with British

353 Household Survey data from women at 3-6 months postnatal (van Bussel, Spitz, &
354 Demyttenaere, 2006), and found no significant difference.

355

356 **Discussion**

357 Breastfeeding is an important health behaviour, which is rewarding for most women
358 but can be challenging to initiate and maintain, contributing to the challenges of early
359 motherhood. Health psychology has much to add to our understanding of this behaviour.
360 The experience of childbirth has a huge influence on how women perceive their body, and
361 self-referent cognitions and emotions during this period have an important influence on
362 breastfeeding (Thome *et al.*, 2006; Figueiredo, Canario & Field, 2014). Since obese women
363 may have poorer body image than healthy weight women, we studied body image in the
364 postnatal period, and its influence on breastfeeding in relation to weight status.

365 Healthy weight women were much more likely to be 'exclusively' breastfeeding in
366 hospital, and maintain breastfeeding at 6-8 weeks than obese women, as found elsewhere
367 (Amir & Donath, 2007). Socio-demographic and biomedical factors were important as found
368 previously (Barnes *et al.*, 1997; McAndrew *et al.* 2012; Oakley *et al.*, 2013). Education level
369 was the most significant predictor of breastfeeding in our final model. Obese women were
370 more likely to have a caesarean section. This is related to less 'exclusive' breastfeeding in
371 hospital, and in turn to shorter breastfeeding duration (Langellier, Pia Chaparro & Whalley,
372 2012).

373 The primary research question focused on predicting breastfeeding maintenance
374 (exclusive or mixed) at 6-8 weeks postnatal. We found all body image components, except
375 appearance orientation were correlated with breastfeeding maintenance and weight status.
376 Higher satisfaction and appearance evaluation were positively related to breastfeeding and

377 negatively related to weight status. Greater preoccupation with overweight and weight
378 self-classification were negatively related to breastfeeding and positively related to weight
379 status. In regression analysis including weight status, body image components as a block
380 added significantly to the variance predicted. Individually, body satisfaction was a significant
381 predictor, and appearance evaluation, body satisfaction, overweight preoccupation and
382 weight self-classification mediated the relationship between weight status and
383 breastfeeding to differing degrees. This replicates and extends findings from Hauff and
384 Demerath's (2012) study, showing body satisfaction and 'comfort' mediated breastfeeding
385 in overweight and obese women (this study had a larger sample, but used a less reliable
386 single-item measure of body satisfaction).

387 Moderation effects of body image on weight status were not significant in this model. This
388 suggests that body image may explain 'how' weight affects breastfeeding maintenance, but
389 not 'who for' (MacMillan & Leucken, 2008).

390 It is important to note that building a more comprehensive model, including weight
391 status, education level, delivery method and psychological distress as well as body image,
392 somewhat negated these effects. Education level, used as a proxy for SES, exemplified the
393 powerful effects of socio-economic status on breastfeeding outcomes. We do not know
394 from this study what specific mechanisms are important here, although research suggests
395 that social and cultural norms which are often unsupportive of breastfeeding in these
396 contexts may be a key factor (Macmillan *et al.* 2009; Darwent, McInnes & Swanson, 2016)

397 Psychological distress was also related to more body dissatisfaction, lower
398 appearance evaluation and higher weight self-classification, but unrelated to weight status
399 and not a significant predictor of breastfeeding maintenance in the final model. However,
400 mean values exceeded accepted cut-offs for 'caseness', suggesting a need for psychological

401 support for some women. New motherhood can be a period of intense positive and
402 negative emotions. Whilst norms tend to emphasise happiness and wellbeing, it is
403 important to recognise that some women may struggle to cope emotionally and practically
404 with the demands of a new baby. Although breastfeeding is a positive, fulfilling and
405 empowering experience for many women it can also be an additional source of stress,
406 particularly where women experience negative emotional states related to embodied
407 aspects of breastfeeding (Watkinson *et al.*, 2016) or self-critical emotions such as failure,
408 guilt or embarrassment, and this merits further study.

409 Few studies have examined changes in body image for women in the few weeks
410 after childbirth. Compared with available US norms (Cash 2000), body image satisfaction
411 was low in our sample. Unfortunately comparable norms were not available for postpartum
412 women (see 'limitations', below). Although the immediate postnatal period is not an ideal
413 time to obtain an accurate 'baseline' for women's body image beliefs, it is suggested that
414 aspects of body image have enduring trait characteristics which change little (Cash, 2002;
415 Nevill, Lane & Duncan, 2015). This applied to appearance orientation (investment) which
416 did not change, but we might have expected to see improvement in some body image
417 perceptions as women moved from a post-pregnancy body, settling into early motherhood
418 and a 'new normality' with a new baby. Instead, we found that overall satisfaction with
419 components of body image reduced for all women between childbirth in hospital and 6-8
420 weeks postnatal, and this was significant for appearance evaluation, body satisfaction
421 (which both reduced) and overweight preoccupation (which increased), confirming that
422 some body image 'states' are context dependent. This dissatisfaction may also reflect
423 undesirable social pressure for women to conform to ideals and stereotypes (Grogan, 2007;
424 Fern *et al.*, 2012) which suggest 'getting back to normal' is seen as both desirable and

425 achievable post childbirth. Pressure to lose weight may be more overt (and hence stressful)
426 for obese women who are stigmatised in relation to their weight and appearance (Puhl &
427 Heuer, 2010). Overall, obese women reported lower body image satisfaction than healthy
428 weight women in hospital postnatally, echoing other research (Hauff & Demerath, 2012;
429 Zanardo *et al.*, 2014) and similarly at 6-8 weeks postnatal. Different aspects of body image
430 (reduced satisfaction, evaluation; increased overweight preoccupation and weight self-
431 classification) changed for both obese and healthy weight women in the 6-8 weeks following
432 childbirth.

433

434 **Methodological Limitations**

435 It would have been ideal to assess baseline body image, and other psychosocial variables
436 either pre- or during pregnancy rather than after childbirth, when a woman's body is in
437 recovery from a life-changing event and emotional arousal is high. Women experiencing
438 pain from caesarean sections or complicated deliveries may have had biased responses.
439 Although the MBSRQ is widely used internationally in clinical samples, the only available
440 population norms were for non-pregnant US women (Cash 2000). It has also been
441 suggested that some MBSRQ components (particularly 'appearance evaluation') show a lack
442 of stability over time with overweight participants (Neville *et al.*, 2015) which may have
443 affected our findings. Breastfeeding as an embodied behaviour undoubtedly influences
444 women's psychological self-concept and 'body confidence' either positively or negatively
445 (Watkinson *et al.* 2016), and we did not explicitly measure embodied cognitions in this
446 study.

447 We deliberately compared discrete groups of healthy weight and obese women but
448 recognise underweight and overweight women may also have different experiences of

449 breastfeeding. We categorised women's weight according to case notes at booking in early
450 pregnancy, acknowledging that this may have changed at Time 2. We followed up the
451 sample at 6-8 weeks, a common time-point chosen in research, however longer follow-up of
452 breastfeeding maintenance would have been useful in relation to assessing body image.
453 Our main outcome measure constructed to represent 'breastfeeding' versus 'no
454 breastfeeding' at Time 2, also did not reflect how long women had breastfed on discharge
455 from hospital, and may have lacked sensitivity, as many women switch to formula in the
456 first 2 weeks post-discharge (McAndrew *et al.*, 2012). Additionally, the study was slightly
457 over-powered at Time 2, with potential for Type 1 error given a relatively large number of
458 variables and multiple testing.

459

460 **Conclusions and Recommendations for Research and Practice**

461 Women's experience of body dissatisfaction is increasingly common in western
462 cultures which stress conformity to a 'thin ideal'. This may have a negative impact on
463 women's postnatal psychological well-being and breastfeeding maintenance. Further study
464 of embodied cognitions and their emotional impact is a fruitful area for health psychologists
465 promoting initiation or breastfeeding maintenance in this context, and could inform and
466 augment social cognitive models (e.g.TPB) or those which identify negative physiological
467 and psychological states as barriers to developing self-efficacy (Bandura, 1986). Using a
468 'dual process' approach (Sheeran, Gollwitzer & Bargh, 2013) to understand how
469 physiological, social or emotional breastfeeding cues experienced at a sub-conscious level,
470 might influence breastfeeding behaviour would be useful. The biological provision of
471 breastmilk is linked with developing positive maternal identity and self-efficacy (Swanson *et.*
472 *al.*, 2012). Conversely negative appraisals, including feelings of failure, embarrassment and

473 discomfort breastfeeding in front of others, are associated with earlier discontinuation
474 (Scott *et al.*, 2015). Open discussion of these issues, including the relationship between
475 weight status, body image and social stigma could help health professionals working with
476 potential new parents, to anticipate barriers to breastfeeding and develop advance coping
477 plans.

478

479 The results have important implications for intervention for those supporting new mothers.

480 Family, peers and health professional's support targeted at individual women's needs is

481 particularly important in the first few weeks of motherhood (Hoddinott *et al.*, 2012). Health

482 promotion interventions normalising women's post-pregnancy and breastfeeding bodies,

483 and de-stigmatising weight issues in this context could encourage new mothers to focus on

484 the body's function, rather than form (Office of Surgeon General, 2011; Fern *et al.*, 2012),

485 increasing women's breastfeeding and maternal confidence, and improve mental health and

486 well-being in this important postnatal period. (4976)

487 **References**

488 Abraham, S., King, W., & Llewellyn-Jones, D. (1994) Attitudes to body-weight, weight-gain
489 and eating behavior in pregnancy. *Journal of Psychosomatic Obstetrics & Gynecology*, 15,
490 189-195.

491

492 Ajzen, I. (1991) The theory of planned behaviour. *Organizational Behavior and Human*
493 *Decision Processes*, 50, 179–211.

494

495 Amir, L.H., & Donath, S. (2007) A systematic review of maternal obesity and breastfeeding
496 intention, initiation and duration. *BMC Pregnancy and Childbirth* 7:9, 1-14.

497 doi:10.1186/1471-2393-7-9

498

499 Baby Friendly Health Initiative (2012) 10 Steps to Successful Breastfeeding. Available at:

500 <http://www.babyfriendly.org.au/about-bfhi/ten-steps-to-successful-breastfeeding/>

501

502 Baker, J.L., Gamborg, M., Heitmann, B.L., Lissner, L., Sørensen, T.L.A., & Rasmussen, K.M.

503 (2008) Breastfeeding reduces postpartum weight retention. *American Journal of Clinical*

504 *Nutrition*, 8, 88, 1543–51.

505

506 Bandura, A. (1986) *Social Foundations of Thought and Action: A Social Cognitive Theory*.

507 Englewood Cliffs, N.J.: Prentice-Hall.

508 Barnes, J., Stein, A., Smith, T., & Pollock, J.I. (1997) Extreme attitudes to body shape, social

509 and psychological factors and a reluctance to breast feed. ALSPAC Study Team. Avon

510 Longitudinal Study of Pregnancy and Childhood. *Journal of the Royal Society of Medicine*, 90,
511 10, 551–559.

512 Baron, R.M., & Kenny, D.A. (1986). The moderator-mediator variable distinction in social
513 psychological research: Conceptual, strategic, and statistical considerations. *Journal of*
514 *Personality and Social Psychology*, 51, 1173-1182.

515

516 Bobrow, K., Quigley, M., Green, J., Reeves, G., & Beral, V. (2009) The long term effects of
517 childbearing and breastfeeding on body mass index in middle aged women, results from the
518 Million Women Study. *Journal of Epidemiology and Community Health*, 63:56.

519 Doi:10.1136/jech.2009.096727d.

520

521 Cai, X., Wardlaw, T., & Brown, D.W. (2012) Global trends in exclusive breastfeeding.

522 *International Breastfeeding Journal*, 7, 12. Published online 2012 Sep 28. doi:

523 10.1186/1746-4358-7-12

524

525 Cash, T. F. (2000). *Users' manuals for the Multidimensional Body-Self Relations*

526 *Questionnaire, the Situational Inventory of Body-Image Dysphoria, and the Appearance*

527 *Schemas Inventory*. Available from the author at www.body-images.com

528

529 Cash, T.F., Fleming, E.C., Alindogan, J., Steadman, L., & Whitehead, A. (2002) Beyond Body

530 Image as a Trait: The Development and Validation of the Body Image States Scale. *Eating*

531 *Disorders*, 10,103–113, DOI: 10.1080/1064026029008167 8

532 Daily Mail Newspaper, (2014) The Great Myth of Breastfeeding Weight Loss. Retrieved from
533 the Internet, 1/6/16. www.dailymail.co.uk/.../The-great-myth-breastfeeding-weightloss-
534 [New-mothers-told-...28 May 2014 -](http://www.dailymail.co.uk/.../The-great-myth-breastfeeding-weightloss-)

535

536 Darwent, KL., McInnes, RJ., Swanson, V. (2016) The Infant Feeding Genogram: A tool for
537 exploring family infant feeding history and identifying support needs. 2*
538 *BMC Pregnancy and Childbirth*, 16:315, DOI 10.1186/s12884-016-1107-

539

540 Denison, F.C., Norwood, P., Bhattacharya, S., Duffy, A., Mahmood, T., Morris, C., Raja, E.A.,
541 Norman, J.E., Lee, A.J., & Scotland, G. (2014) Association between maternal body mass index
542 during pregnancy, short-term morbidity, and increased health service costs: a population-
543 based study. *British Journal of Obstetrics and Gynaecology*, 121,1, 72-81. doi:
544 10.1111/1471-0528.12443.

545

546 Dennis, C-L. (2006) The Breastfeeding Self-Efficacy Scale: Psychometric Assessment of the
547 Short Form *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, 32, 6, 734-744.

548

549 Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical
550 power analysis program for the social, behavioral, and biomedical sciences. *Behavior*
551 *Research Methods*, 39, 175-191.

552 Fern, V.A., Buckley B., Grogan, S. (2012) Women's experiences of body image and weight
553 loss after childbirth. *British Journal of Midwifery*, 20, 860-865.

554

555 Figueiredo, B., Canario, C., & Field, T. (2014) Breastfeeding is negatively affected by prenatal
556 depression and reduces postpartum depression. *Psychological Medicine*, 44, 5, 927-936.

557

558 Foulkes, J.L., Dundas, K.C., & Denison, F.C. (2008) Infant feeding intentions of Scottish
559 adolescents. *Scottish Medical Journal*. May, 53, 2, 9-11.

560

561 Francis, J.J., Eccles, M.P., Johnston, M., Walker, A., Grimshaw, J., Foy, R...Bonetti, D.
562 (2004). *Constructing questionnaires based on the theory of planned behavior: A manual for*
563 *health services researchers*. Newcastle upon Tyne: Centre for Health Services Research.

564

565 Goldberg, D.P. & Williams, D.P.M. (1988) *A user's guide to the General Health Questionnaire*,
566 NFER-Nelson, Windsor, Berks.

567

568 Goldberg, D.P., Gater, R., Sartorius, N., Ustun, T.B., Piccinelli, M., Gureje, O., Rutter, C.
569 (1997) The validity of two versions of the *GHQ* in the WHO study of mental illness in general
570 health care. *Psychological Medicine*, 191-197.

571 Grogan, S. (2008) *Body image: Understanding body dissatisfaction in men, women and*
572 *children* (2nd ed): New York, NY, US: Routledge/Taylor & Francis Group.

573

574 Hauff, L.E., & Demerath, E.W. (2012) Body Image Concerns and Reduced Breastfeeding
575 Duration in Primiparous Overweight and Obese Women. *American Journal of Human*
576 *Biology*, 24, 339–349.

577

578 Hayes, A. F. (2009). Beyond Baron and Kenny: Statistical mediation analysis in the new
579 millennium. *Communication Monographs*, 76, 408-420.

580

581 Hilson, J.A., Rasmussen, K.M., Kjolhede, C.L. (2004) High pre-pregnant Body Mass Index is
582 associated with poor lactation outcomes among rural white women independent of
583 psychosocial and demographic correlates. *Journal of Human Lactation*, 20,1, 18-29.

584

585 Hoddinott, P., Craig, L.C.A, Britten, J, & McInnes, R.J. (2012). A serial qualitative interview
586 study of infant feeding experiences: idealism meets realism. *British Medical Journal Open*,
587 2:e000504. doi:10.1136/bmjopen-2011-000504

588

589 Hodgkinson, E.L., Smith, D.M.,& Wittkowski, A. (2014) Women’s experiences of their
590 pregnancy and postpartum body image: a systematic review and meta-synthesis. *BMC*
591 *Pregnancy and Childbirth*, 23, 14:330.

592

593 Huang, H., Wang, S., & Chen, C. (2004) Body image, maternal-fetal attachment, and choice
594 of infant feeding method: A study in Taiwan. *Birth*, 31, 183-88

595

596 Information Statistics Division, Scotland. (2015). Breastfeeding Statistics Scotland. Scottish
597 Government, 27th October 2015.

598

599 Keely, A., Lawton, J., Swanson, V., & Denison, F.C. (2015) Barriers to breast-feeding in obese
600 women: A qualitative exploration. *Midwifery*. 31, 5, 532-9. doi:

601 10.1016/j.midw.2015.02.001.

602

603 Kronborg, H., Vaeth, M., & Rasmussen, K.M. (2012). Obesity and early cessation of
604 breastfeeding in Denmark. *European Journal of Public Health*, 135, 316-322.

605 DOI: <http://dx.doi.org/10.1093/eurpub/cks135> 316-322

606

607 Langellier, B.A., Pia Chaparro, M., & Whaley, S.E. (2012) Social and institutional factors that
608 affect breastfeeding duration among WIC participants in Los Angeles County, California.

609 *Maternal and Child Health Journal*, 16,9, 1887-1895. doi:10.1007/s10995-011-0937-z

610

611 Lawton, R., Ashley, L., Dawson, S., Waiblinger, D., & Conner, M. (2012) Employing an

612 extended Theory of Planned Behaviour to predict breastfeeding intention, initiation, and

613 maintenance in White British and South-Asian mothers living in Bradford. *British Journal of*

614 *Health Psychology*, 4, 854-71. doi: 10.1111/j.2044-8287.2012.02083.x.

615
616
617
618
619
620
621
622
623
624
625
626
627
628
629
630
631
632
633
634
635
636
637
638

Leddy, M.A., Power, M.L., & Schulkin, J. (2008) The impact of maternal obesity on maternal and fetal health. *Review of Obstetrics and Gynecology*. 1, 4,170-178.

Lupton, D. (2012) *Configuring Maternal, Preborn and Infant Embodiment*. Sydney Health & Society Group Working Paper No. 2. Sydney: Sydney Health & Society Group. Available at <http://hdl.handle.net/2123/8363>

McAndrew, F., Thompson, J., Fellows, L., Large, A., Speed, M., & Renfrew, M.J. (2012) *UK Infant Feeding Survey*. NHS England, Health and Social Care Information Centre.

MacKinnon, D.P., & Luecken, L.J. (2008). **How and for Whom? Mediation and Moderation in Health Psychology.** *Health Psychology*, 27, 2 (Suppl), S99 doi: [10.1037/0278-6133.27.2\(Suppl.\).S99](https://doi.org/10.1037/0278-6133.27.2(Suppl.).S99)

McMillan, B., Conner, M., Green, J. Dyson, L., Renfrew, M, & Woolridge, M. (2009) Using an extended theory of planned behavior to inform interventions aimed at increasing breastfeeding uptake in primiparas experiencing material deprivation. *British Journal of Health Psychology*, 14, 379–403

Marshall, J.L., Godfrey, M., Renfrew, M.J. (2007) Being a ‘good mother’: Managing breastfeeding and merging identities. *Social Science & Medicine*, 65, 2147–2159. doi: [10.1016/j.socscimed.2007.06.015](https://doi.org/10.1016/j.socscimed.2007.06.015)

- 639 Meier, B. P., Schnall, S., Schwarz, N., Bargh, J.A. (2012). Embodiment in Social Psychology.
640 *Topics in Cognitive Science*, 4, 4, 705–716. DOI: 10.1111/j.1756-8765.2012.01212.x
641
- 642 Michie, S., Richardson, M., Johnston, M., Abraham, C., Francis, J., Hardeman, W., Eccles,
643 M.P., Cane, J., Wood, C.E. (2013) The behavior change technique taxonomy (v1) of 93
644 hierarchically clustered techniques: building an international consensus for the reporting of
645 behavior change interventions. *Annals of Behavioral Medicine*, 46, 1, 81-95. doi:
646 10.1007/s12160-013-9486-6.
647
- 648 Mina, T.H., Denison, F.C., Forbes, S., Stirrat, L.I., Norman, J.E., & Reynolds, R.M. (2015)
649 Associations of mood symptoms with ante- and postnatal weight change in obese
650 pregnancy are not mediated by cortisol. *Psychological Medicine*, 45, 15, 3133-46. doi:
651 10.1017/S0033291715001087.
652
- 653 Mok, E., Multon, C., Piguel, L., Barroso, E., & Goua, V. (2008) Decreased full practices,
654 perceptions and infant weight change in infants of pre-pregnant obese women: a need for
655 extra support *Pediatrics*, 121, 5, e1319-1324
656
- 657 Nevill, A.M., Lane, A.M., & Duncan, M.J. (2015) Are the Multidimensional Body Self-
658 Relations Questionnaire Scales stable or transient?, *Journal of Sports Sciences*, 33, 18, 881-
659 1889. DOI: 10.1080/02640414.2015.1018930
660

- 661 Oakley, L.L., Renfrew, M.J., Kurinczuk, J.J., & Quigley, M.A. (2013) Factors associated with
662 breastfeeding in England: an analysis by primary care trust. *BMJ Open* ;3:e002765
663 doi:10.1136/bmjopen-2013-002765
664
- 665 Office of the Surgeon General (US), (2011). The Surgeon General's Call to Action to Support
666 Breastfeeding. Rockville (MD): Office of the Surgeon General (US); *Barriers to Breastfeeding*
667 *in the United States*. Available from: <http://www.ncbi.nlm.nih.gov/books/NBK52688>
668
- 669 Orbach, S., & Ruben, H. (2014) *Two for the price of one. The impact of body image during*
670 *pregnancy*. UK Department for Culture, Media & Sport and Government Equalities Office
671
- 672 Pampel, F.C., Denney, J.T., & Krueger, P.M. (2012). Obesity, SES, and Economic
673 Development: A Test of the Reversal Hypothesis. *Social Science and Medicine* 74, 7. 1073-81.
674
- 675 Preacher, K .J., & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects
676 in simple mediation models. *Behavior Research Methods, Instruments, and Computers*, 36,
677 717-721.
678
- 679 Puhl, R.M., & Heuer, C.A. (2010) Obesity Stigma: Important Considerations for Public Health.
680 *American Journal of Public Health*, 100, 6, 1019–1028. doi: 10.2105/AJPH.2009.159491
681
- 682 Renfrew, M.J., Wallace, L.M., D'Souza, L., McCormick, F., Spiby, H, & Dyson, L. (2005). *The*
683 *effectiveness of public health interventions to promote the duration of breastfeeding:*

- 684 *systematic reviews of the evidence*. National Institute for Health and Clinical Excellence,
685 London
- 686
- 687 Sassi, F., Devaux, M., Cecchini, M., & Rusticelli, E. (2009). The Obesity Epidemic: Analysis of
688 Past and Projected Future Trends in Selected OECD Countries. *OECD Health Working Papers,*
689 *France*, 45, 81. DOI:10.1787/225215402672
- 690
- 691 Schmied, V.M., Duff, M., Dahlen, H.G., Mills, A.E., & Kolt, G.S. (2011) 'Not waving but
692 drowning'; a study of the experiences and concerns of midwives and other health
693 professionals caring for obese childbearing women *Midwifery*, 27,4, 424-430.
- 694
- 695 Scott, J.A., Kwok, Y.Y., Synnott, K., Bogue, J., Amarri, S., Norin, E., Gil, A., Edwards, C.A.,
696 INFABIO Project Team. (2015) A Comparison of Maternal Attitudes to Breastfeeding in
697 Public and the Association with Breastfeeding Duration in Four European Countries: Results
698 of a Cohort Study. *Birth*, 42, 1, 75-86.
- 699
- 700 Sheeran, P., Gollwitzer, P. M., & Bargh, J. A. (2013). Nonconscious processes and health.
701 *Health Psychology*, 32, 460–473. doi:10.1037/a0029203
- 702
- 703 Stewart-Knox, B., Gardiner, K., & Wright, M. (2003) What is the problem with breast-
704 feeding? A qualitative analysis of infant feeding perceptions. *Journal of Human Nutrition and*
705 *Diet*, 16, 265–273.
- 706

- 707 Stuebe, A.M., & Bonuck, K. (2011) What predicts intent to breastfeed exclusively?
708 Breastfeeding knowledge, attitudes, and beliefs in a diverse urban population. *Breastfeeding*
709 *Medicine: The Official Journal of the Academy of Breastfeeding Medicine*. 6, 6,413-20.
710
- 711 Swanson, V., & Power, K.G. (2004) Attitudes and normative beliefs: factors influencing
712 initiation and continuation of breastfeeding. *Journal of Advanced Nursing*. 50, 3, 272-282.
713
- 714 Swanson, V., Power, K.G., Kaur, B., Carter, H. & Shepherd, K. (2006) The impact of
715 knowledge and social influences on adolescents' breastfeeding beliefs and intentions. *Public*
716 *Health Nutrition*, 9, 3, 297-305.
717
- 718 Swanson, V., Nicol, H., McInnes, R., Cheyne, H., Mactier, H., & Callander, E. (2012)
719 Developing Maternal Self-efficacy for Feeding Pre-term Babies in the Neonatal Unit.
720 *Qualitative Health Research*. 22, 10, 1-14. doi:10.1177/1049732312451872
721
- 722 Thome, M., Alder, E.M., & Ramel, A. (2006) A population-based study of exclusive
723 breastfeeding in Icelandic women: is there a relationship with depressive symptoms and
724 parenting stress? *International Journal of Nursing Studies*, 43, 1, 11–20
725 DOI: <http://dx.doi.org/10.1016/j.ijnurstu.2004.10.009>
726
- 727 Thompson, L.A., Zhang, S., Black, E., Das, R., Ryngaert, M., Sullivan, S., Roth, J. (2012) The
728 Association of Maternal Pre-pregnancy Body Mass Index with Breastfeeding Initiation.
729 *Maternal Child Health Journal*, (published online) DOI 10.1007/s10995-012-1204-7

730
731
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737
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742
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744
745
746
747
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749
750
751

van Bussel, J.C.H., Spitz, B., & Demyttenaere, K. (2006) Women’s Mental Health Before, During, and After Pregnancy: A Population-Based Controlled Cohort Study. *Birth*, 33, 4, 297-302.

Victora, C.G., Bahl, R., Barros, A.J.D., França, G.V.A., Horton, S., Krasevec, J., Murch, M., Sankar, J., Walker, N., & Rollins, NG. For The Lancet Breastfeeding Series Group. (2016) Breastfeeding in the 21st century: epidemiology, mechanisms, and lifelong effect. *The Lancet*, 30 January–5 February, 475–490.

Viriden, S. F. (1988). The relationship between infant feeding method and maternal role adjustment. *Journal of Nurse-Midwifery*, 33, 31–33. doi: 10.1016/0091-2182(88)90246-7

Watkinson, M., Murray, C., Simpson, J. (2016) Maternal experiences of embodied emotional sensations during breast feeding: An Interpretative Phenomenological analysis. *Midwifery*, 36, 53–60.

Wojcicki, J.M. (2011) Maternal pre-pregnancy body mass index and initiation and duration of breastfeeding: a review of the literature. *Journal of Women’s Health (Larchmt)*. 20, 3, 341-7. doi: 10.1089/jwh.2010.2248.

752 World Health Organization. (2009). Baby-friendly hospital initiative. Revised, updated, and
753 expanded for integrated care. Retrieved from: [http://www.who.int/nutrition/publications/
754 infantfeeding/bfhi_trainingcourse/en/](http://www.who.int/nutrition/publications/infantfeeding/bfhi_trainingcourse/en/).

755

756 Zanardo, V., Gambina, I., Nicolo, M.E., Giustardi, A., Cavallin, F., Straface, G., Trevisanuto, D.
757 (2014) Body image and breastfeeding practices in obese mothers. *Eating & Weight
758 Disorders*, 19,1, 89-93. <http://dx.doi.org/10.1007/s40519>.

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760 **Table 1: Women’s Breastfeeding Status at Time 1 (In hospital) and Time 2 (6-8 Weeks**
 761 **Postnatal.**
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		FEEDING METHOD			
		Exclusive Breastfeeding	Mixed feeding	Exclusive Formula Feeding	χ², p
Time 1					
n=70	Healthy	62 (89%)	8 (11%)	-	χ ² (1) = 5.56, p=.018
	Weight				
n=70	Obese	51 (73%)	19 (27%)	-	
	TOTAL	113	27	-	
Time 2					
n=60	Healthy	32 (53%)	18 (30%)	10 (17%)	χ ² (2) = 5.93, p=.052
	Weight				
n=58	Obese	25 (43%)	12 (21%)	21 (36%)	
	TOTAL	57	30	31	

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764 **Table 2: Participant characteristics at Time 1 (In hospital)**

<i>Characteristic</i>	<i>Healthy Weight</i>	<i>Obese</i>	<i>P</i>
	N=70	N=70	
Age (years)¹	32.7 (5.2)	31.4 (5.5)	0.15
BMI (kg/m²)¹	22.7 (1.7)	35.6 (4.6)	N/A
Baby weight (g)¹	3519 (450)	3510 (563)	0.92
Parity²			0.32
0	43 (61%)	43 (61%)	
1-2	26 (37%)	23 (32%)	
3+	1 (1%)	4 (7%)	
Delivery²			0.009
SVD	45 (64%)	31 (44%)	
Instrumental Vaginal	14 (20%)	12 (17%)	
CS	11 (16%)	17 (39%)	
Baby Gender²			0.61
Male	34 (49%)	30 (43%)	
Female	36 (51%)	40 (57%)	
Smoke²			0.65
No	60(86%)	57(81%)	
Ever	10(14%)	13(19%)	
Education²			0.02
None	1 (1%)	2 (3%)	
Standard	6 (9%)	12 (17%)	
Highers	4 (6%)	13 (19%)	
Degree/Dip	35 (50%)	31 (44%)	
Postgraduate	24 (34%)	12 (17%)	

765 Key: ¹ Mean (SD), ² N (%), BMI – Body Mass Index; SVD – Spontaneous Vertex Delivery; CS -
766 Caesarean Section

	1	2	3	4	5	6	7	8	9	10
1 Breastfeeding^a	-	-.02*	.39***	-.13	.21*	-.06	.36***	-.23*	-.23*	-.19*
2 Weight status		-	-.25**	.20*	-.40***	-.02	-.48***	.43***	.78***	.06
3 Education level			-	-.15	.12	-.01	.29**	-.23*	-.15	-.15
4 Delivery^b				-	-.09	-.09	-.23*	.04	.21*	.03
5 Appearance evaluation					-	.08	.83***	-.56***	-.61***	-.36***
6 Appearance orientation						-	.11	.25**	-.02	-.04
7 Body satisfaction							-	-.56***	-.62***	-.41***
8 Overweight preoccupation								-	.46***	.10
9 Self classification									-	.20*
10 Psychological distress										-

767 **Table 3: Pearson Correlations between Breastfeeding^a, Education Level, Delivery Method^b, Body Image (MBSRQ) and Psychological Distress**
768 **at Time 2 (6-8 weeks)**

769
770 ^aBreastfeeding, 1 = no breastmilk; 2 = any breastmilk; ^bDelivery Method 1 = Vaginal, 2= Caesarean Section
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772 **Table 4: Logistic Regression Predicting Breastfeeding at 6-8 weeks from Weight status,**
 773 **Education level, Delivery Method, Body Image (MBSRQ) and Psychological Distress at**
 774 **Time 2 (6-8 weeks)**

	<i>B(SE)</i>	<i>Wald</i>	<i>p</i>	<i>Model χ^2, p</i>	<i>^aR²</i>
Model 1:				$\chi^2 = 4.60, p=.03$.06
<i>Weight status</i>	.95 (.45)	4.42	.03		
Model 2:				$\chi^2 = 18.29, p<.001$.22
<i>Weight Status</i>	.54 (.50)	1.17	.28		
<i>Education level</i>	.88 (.26)	11.72	<.001		
<i>Delivery Method</i>	.16 (.52)	.09	.76		
Model 3:				$\chi^2 = 26.21, p<.001$.31
<i>Weight status</i>	-.05 (.81)	.004	.94		
<i>Education Level</i>	.80 (.27)	8.46	.004		
<i>Delivery Method</i>	.17 (.55)	.09	.76		
<i>Appearance orientation</i>	-.95 (.71)	1.80	.18		
<i>Body satisfaction</i>	1.33 (.63)	4.47	.03		
<i>Overweight preoccupation</i>	.20 (.43)	.23	.63		
<i>Self-classification</i>	-.17 (.56)	.09	.77		
Model 4:				$\chi^2 = 26.40, p=.001$.31
<i>Weight status</i>	.02 (.83)	.001	.98		
<i>Education Level</i>	.79 (.28)	8.03	.005		
<i>Delivery Method</i>	.17 (.55)	.09	.76		
<i>Appearance orientation</i>	-.93 (.71)	1.70	.19		
<i>Body satisfaction</i>	1.21 (.69)	3.08	.07		
<i>Overweight</i>	.17 (.43)	.16	.70		

779 **Table 5: Logistic Regression Models investigating Body image variables (Time 2) as**
 780 **mediators of the relationship between weight status and breastfeeding at 6-8 weeks**

<i>Body Image</i>		<i>B (SE)</i>	<i>Wald (p)</i>	<i>Exp B</i>	<i>BCa 95% CI</i>		
					Lower	Upper	
Appearance evaluation	Model 1	Weight status	1.08 (.44)	5.91 (.015)	2.90	1.23	7.01
	Model 2	Weight status	.83 (.47)	3.08 (.08)	2.31	.91	5.86
		Appearance Evaluation	.47 (.35)	1.86 (.17)	1.60	.81	3.18
Appearance orientation	Model 1	Weight status	1.02 (.44)	5.36 (.02)	2.78	1.17	6.72
	Model 2	Weight status	1.04 (.44)	5.49 (.02)	2.81	1.18	6.71
		Appearance orientation	-.39 (1.1)	.55 (.45)	3.96	.24	1.89
Body satisfaction	Model 1	Weight status	.99 (.44)	5.01 (.025)	2.73	1.13	6.45
	Model 2	Weight status	.32 (.50)	.42 (.52)	1.38	.52	3.65
		Body satisfaction	1.40 (.45)	9.79 (.002)	4.07	1.69	9.81
Overweight preoccupation							

Body Image and Breastfeeding Maintenance

Model 1	Weight status	1.00 (.45)	5.01 (.03)	2.74	1.13	6.61
Model 2	Weight status	.69 (.49)	1.99 (.16)	1.99	.76	5.21
Self-classification	Overweight preoccupation	-.49 (.30)	2.57 (.11)	.61	.34	1.12
Model 1	Weight status	1.07 (.44)	5.84 (.02)	2.91	1.22	6.97
Model 2	Weight status	.61 (.66)	.84 (.35)	1.84	.50	6.77
	Self-classification	.41 (.44)	.86 (.35)	1.50	.64	3.53

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782 **Table 6: Means, Group Comparisons, and Normative Comparisons for Multidimensional Body-Self Relations Questionnaire (MBSRQ) Items,**
 783 **and Psychological Distress (GHQ), Comparing Healthy Weight and Obese Women at Time 1 (After Childbirth) and Time 2 (6-8 weeks**
 784 **postnatal).**

	<i>Time 1</i>		<i>Time 2</i>		<i>Effect</i>	<i>F, p</i> <i>(1,114)</i>	<i>Partial</i> <i>Eta²</i>	<i>Norm^a</i>	<i>p²</i>
	Healthy Weight	Obese	Healthy Weight	Obese					
Appearance Evaluation¹	3.48 (.44)	2.75 (.60)	3.11 (.64)	2.57 (.63)	Time	29.21, p<.001	.21	3.4 (.87)	p<.001 p<.001
					WeightStatus	42.51, p<.0001	.27		
Appearance Orientation¹	2.16 (.46)	2.07 (.44)	2.09 (.41)	2.07 (.41)	Time	3.09, p=.08	.03	3.9 (.60)	p<.001 p<.001
					WeightStatus	.62, p=.43	.005		
Body satisfaction¹	3.71 (.32)	2.94 (.56)	3.41 (.54)	2.80 (.50)	Time	25.30, p<.001	.18	3.2 (.07)	p=.07 p=.03
					WeightStatus	74.09, p<.0001	.39		
Overweight preoccupation¹	2.12 (.70)	2.74 (.78)	2.26 (.70)	2.93 (.76)	Time	14.28, p<.001	.12	3.0 (.96)	p<.001 p<.001
					WeightStatus	23.25, p<.0001			

Body Image and Breastfeeding Maintenance

Self - Classification¹	3.02 (.34)	4.32 (.51)	3.17 (.38)	4.31 (.56)	Time	3.46, p=.07	.02	3.6 (.73)	p=.09 p=.02
					Weight Status	263.48, p<.0001	.70	-	-
Psychological Distress (GHQ)¹	11.05(4.5)	13.09(4.8)	11.98 (5.3)	12.42 (6.0)	Time	.06, p=.90	.01	11.16 (5.4)	p= .24 p=.06
					Weight Status	1.66, p=.20	.02	-	-

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¹Mean (SD); ²One sample t-tests for whole sample Time 1 and Time 2

^aNorms from Cash (2002); Comparison data from van Bussell et al. (2006)