

RESEARCH

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[7]. For instance, breastfeeding-induced oxytocin release has been associated with decreased stress and cortisol levels in mothers [8]. Nonetheless, breastfeeding rates are

effects of the breastfeeding intention and behavior relationship.

## Methods

### Study design

This is a UK observational prospective longitudinal study including pregnant women and following them until 6 months post-partum.

### Participants and procedure

Participants were recruited at the antenatal clinic at Queen Charlotte's and Chelsea Maternity Hospital (QCCM) in London, UK. Women listed by the antenatal clinic to attend their 20 weeks ultrasound control were approached by a doctoral student who provided oral and written information about the study. Women were eligible if they were between 20–22 weeks gestation, aged between 18 and 45 years old, self-reported computer literate, fluent in English, and had access to a device with internet access. Exclusion criteria included severe medical disorders (e.g., epilepsy), a currently diagnosed severe psychiatric disorder (e.g., psychosis or drug addiction), high-risk pregnancy (e.g., preeclampsia), medically assisted reproduction, or multiple pregnancy. Postnatally, women who had a premature birth (< 36 weeks) and/or a baby with a severe disorder (e.g., heart defect) were excluded. Physical copies of participants' medical records were checked weekly by the student to confirm post-partum inclusion criteria as well as to collect birth and baby's information.

Women who agreed to participate and provided written informed consent during recruitment ( $N=369$ ), provided basic personal information (name, email address, home address, telephone, date of birth, baby due date, gestational age) and completed online surveys from pregnancy ( $T1$ : 20–22 gestational weeks,  $T2$ : 28 gestational weeks,  $T3$ : 36 gestational weeks) to post-partum ( $T4$ : 1 month,  $T5$ : 6 months). At each subsequent time point, participants were sent an email containing a link to complete the online questionnaires. For those who did not complete the questionnaires, up to fo(S)4(tudy desig)45

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assessed it as a continuous variable in which higher levels indicate increased stress. Cronbach's alpha for this sample was  $\alpha = 0.60$ . The complete instrument was utilized for this study and, additionally we created a composite variable (Cronbach  $\alpha = 0.85$ ) by averaging the results from the three time points of antenatal assessments.

Coping styles were measured with the English version of the *Utrecht Coping List-19* (UCL-19) [43, 44]. This 19-items questionnaire describes an individual tendency for five coping styles: emotional coping, avoidant coping, palliative coping, problem-focused coping and social coping. The 4-point Likert scale ranges from 0 ("never") to 3 ("very often") with high scores indicating a tendency to apply the specified coping style when facing unpleasant events. This questionnaire was successfully used in research involving pregnant and post-partum women and was filled out by our participants at all time points. Principal component analysis, supported by consideration of previous literature, and follow-up analysis that

milk only, combined human milk and formula feeding, and formula feeding only. We define breastfeeding at 1 month as exclusive (i.e., human milk only) and partial (i.e., combined human and formula feeding) breastfeeding. Breastfeeding persistence was defined as exclusive breastfeeding (i.e., human milk only) at 6 months; we also ran supplementary analyses examining partial breastfeeding (i.e., combined human and formula feeding) at 6 months.

Socio-demographic information was collected at 20–22 weeks gestation and birth and baby characteristics were obtained from participants' medical records. Key variables were: marital status (married/cohabitating vs. single), ethnic/race group (although overall ethnically/racially diverse—6.4% Asian or Asian British, 3.6% Black, Black British, Caribbean or African, 5.3% Mixed or multiple ethnic groups, 19.8% Other ethnic groups—the small number of most race and ethnic categories necessitated coding this as white vs. non-white), gravidity (number of times that a woman has been pregnant, discrete variable), parity (number of times that she has given birth to a fetus with a gestational age of 24 weeks or more, continuous variable), monthly income (ranging from <math>18,000</math> £ to >100,000 £), self-reported current smoking (any smoking, yes vs. no), self-reported current alcohol consumption (any level of consumption, yes vs. no), maternal education (university degree or higher vs. no university degree), currently working (yes vs. no), delivery mode (caesarean section vs. other), maternal age at delivery (continuous variable), child sex (boy vs. girl) and neonatal weight (continuous variable). We included covariates which were previously found to be robust predictors of breastfeeding on an a priori basis, namely parity, ethnicity [45] education [46] and mode of delivery [47].

Our outcomes consist of the intention to breastfeed and breastfeeding behaviour measured through multiple choice questions, whereas our exposures were depressive symptoms, anxiety symptoms, SLEs and coping measured through the above-mentioned questionnaires. Our analyses also controlled for sociodemographic and birth and baby characteristics obtained through a questionnaire and medical records.

#### Ethics considerations

Ethical approval was obtained from the Imperial College Healthcare Trust ethics committee and NHS Health Research Authority ethics committee before commencement of the study (Approval No. 13EE0059).

This study and all its experiments were conducted in accordance with the principles of the Declaration of Helsinki.

#### Statistical analyses

Descriptive statistics including frequency, percentage, median and interquartile range were used to summarize the study data. Since most of the affective symptoms and coping sub-scales were skewed, we applied log transformation using the formula  $\log_{10}(\text{value} + 1)$ . Visual inspections and Kolmogorov–Smirnov tests showed that some variables were still not normally distributed, but the skewness of the data was improved; therefore, non-parametric tests (e.g., Spearman correlations) were also conducted. We created composite variables for anxiety symptoms, depressive symptoms, stressful life events and maternal coping for the antenatal period by averaging the results from the three time points of antenatal assessments. However, post-partum measures, namely depressive symptoms, were not combined so that it was possible to assess concurrent and longitudinal associations between psychological measures and breastfeeding behavior. Spearman correlations were conducted between covariates, affective symptoms, maternal coping, intention to breastfeed and breastfeeding at one and six months. The aforementioned tests were used to analyse our two research aims.

Binomial logistic regression was our primary analytic strategy to analyse our first aim; analyses of exclusive and partial breastfeeding were done at one-month; following WHO recommendations, we defined persistence as exclusive breastfeeding through six months. All potential predictors of breastfeeding at 1 and 6 months were entered in one single model together with the covariates. Given our interest in assessing intention to breastfeed independently from other demographic and psychological/behavioral variables, we included education, ethnicity, antenatal and post-partum depression, and antenatally-paripiles osny-7(s)-8(r)6(e)o [(ti24 312.0)9(t)6sny-7 B4

intention \* antenatal depressive symptoms). A two-sided *P*-value of  $<0.05$  was used to assess statistical significance. Statistical analyses were performed using the IBM Statistical Package for the Social Sciences (IBM SPSS Statistics for Windows Version 24.0).

## Results

Data was collected from April 2012 to April 2013. Sample characteristics are shown in Table 1. There was modest evidence of selective attrition from enrolment until 6 months. We tested for selective attrition by creating a variable indicating the number of completed visits (scores range from 1 to 5) and using this group vari-

post-partum depression and socio-demographic factors. The prediction from intention to breastfeeding was weaker for exclusive breastfeeding persistence until 6 months (Table 4): a marginally significant association was found between intention to breastfeed and exclusive breastfeeding ble

Additional analyses indicated no significant evidence  
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active symptoms should not discourage breastfeeding or interventions to improve breastfeeding.

There are limitations to this study. The sample was recruited from one London Hospital serving the National Health System and the community sample was diverse, but weighted toward high levels of education, professional status and income than the UK. The high breastfeeding rates may also reflect hospital practice, as midwives' training programmes at this hospital actively encourage breastfeeding. Thus, the findings from this study gives insight into this particular UK population group and may not generalize to high-risk samples and settings. Our results should be replicated in low-income populations where often family stress and lack of food to support breastfeeding may adversely affect maternal mental health and their ability to sustain breastfeeding despite their best intentions. Moderation analyses could have been impaired by insufficient power given that a large sample size is needed to find a moderation effect. In addition, we had limited data on socio-economic context, most notably maternal working conditions. Our focus instead is on psychological and behavioral predictors in order to identify the most robust and potentially modifiable factors. Also, there was attrition across the perinatal period, but this was not very strongly associated with initial distress. Finally, the study assessed breastfeeding on only two occasions until 6 months, which is consistent with many previous studies; nonetheless, more intensive assessments and longer follow-up periods might yield different patterns of results. The study strengths include the longitudinal data collection involving multiple assessments, which enabled us to examine any exacerbation of active symptoms, stress, and coping in relation to breastfeeding in a repeated fashion.

## Conclusion

In a UK community sample, we found that antenatal intention to breastfeed was a robust predictor of breastfeeding, in contrast to a wide range of behavioral and

6. Westerfield KL, Koenig K, Oh R. Breastfeeding: common questions and answers. *Am Fam Physician*. 2018;98(6):368–73.
7. Krol KM, Grossmann T. Psychological effects of breastfeeding on children and mothers. *Bundesgesundheitsblatt-Gesundheitsforschung Gesundheitsschutz*. 2018;61(8):977–85.
8. UvnäsMoberg K, Ekström-Bergström A, Buckley S, Massarotti C, Pajalic Z, Luegmair K, et al. Maternal plasma levels of oxytocin during breastfeeding—a systematic review. *PLoS One*. 2020;15(8):e0235806.
9. Regional Office for Europe WHO. WHO European Region has lowest global breastfeeding rates 2015. 2024. Available from: <http://www.euro.who.int/en/health-topics/Life-stages/maternal-and-newborn-health/news/news/2015/08/who-european-region-has-lowest-global-breast-feeding-rates>.
10. UNICEF. Breastfeeding 2023. 2023. Available from: <https://data.unicef.org/topic/nutrition/breastfeeding/>.
11. Black R, McLaughlin M, Giles M. Women's experience of social media breastfeeding support and its impact on extended breastfeeding success: a social cognitive perspective. *Br J Health Psychol*. 2020;25(3):754–71.
12. Institute NH. Maternity and breastfeeding. 2015. Available from: <https://www.england.nhs.uk/statistics/statistical-work-areas/maternity-and-breastfeeding/>.
13. Dutheil F, Méchin G, Vorilhon P, Benson AC, Bottet A, Clinchamps M, et al. Breastfeeding after returning to work: a systematic review and meta-analysis. *Int J Environ Res Public Health*. 2021;18(16):8631.
14. Lau CYK, Lok KYW, Tarrant M. Breastfeeding duration and the theory

52. Sartor L, Pyram-Vincent C, Lin HM, Ouyang Y, Wax DB, Beilin Y. Race and intention to breastfeed are the strongest predictors of exclusive breastfeeding: a retrospective study. *J Racial Ethn Health Disparities*. 2024;11(6):3704–13.
53. Blyth R, Creedy DK, Dennis CL, Moyle W, Pratt J, De Vries SM. Effect of maternal confidence on breastfeeding duration: an application of breastfeeding self-efficacy theory. *Birth*. 2002;29(4):278–84.
54. Haslam C, Lawrence W, Haefeli K. Intention to breastfeed and other important health-related behaviour and beliefs during pregnancy. *Fam Pract*. 2003;20(5):528–30.
55. Raissian KM, Su JH. The best of intentions: antenatal breastfeeding intentions and infant health. *SSM Popul Health*. 2018;5:86–100.
56. Wood NK, Woods NF, Blackburn ST, Sanders EA. Interventions that enhance breastfeeding initiation, duration, and exclusivity: a systematic review. *MCN Am J Matern Child Nurs*. 2016;41(5):299–307.
57. Hannula L, Kaunonen M, Tarkka MT. A systematic review of professional support interventions for breastfeeding. *J Clin Nurs*. 2008;17(9):1132–43.

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