

**Relationships between Postpartum Anxiety,
Breastfeeding Self-Efficacy, and Breastfeeding
Exclusivity**

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ABSTRACT

Background

Though several important barriers to exclusive breastfeeding (EBF) have been identified, the relationship between postpartum anxiety and EBF remains inadequately explored.

Objective

The objective of this study was to determine if there was a significant relationship between postpartum anxiety and EBF and, if so, determine if breastfeeding self-efficacy moderated this relationship.

Methods

This was a cross-sectional, online survey. Eligibility criteria: mothers (at least 18 years of age), with an infant (aged 4-24 weeks), and who had provided breastmilk at least once in the previous two weeks. The survey instrument included demographic questions and three scales: the EPDS (Edinburgh Postpartum Depression Scale; score range: 0-30), the STAI (State Trait Anxiety Inventory; score range: 0-60), and the BSES-SF (Breastfeeding Self-Efficacy Scale, short form; score range: 14-70).

Results

The final sample size was 123. The majority reported being white (91.0%; n=112), non-Hispanic (91.0%; n=112), married (75.6%; n=93) and EBF at survey completion (61%; n=75). Mean scale scores: STAI, 26.1 (+/-13.10), EPDS, 10.3 (+/-4.30), and BSES-SF, 56.4 (+/-11.25). Anxiety (STAI) was significantly negatively related to breastfeeding self-efficacy ($p=0.047$) but not EBF ($p=0.357$). Path analysis showed an indirect effect of anxiety on EBF via direct impact on breastfeeding self-efficacy ($p=0.025$; model: $p<0.001$, R-square = 0.318).

Conclusion

In this largely homogeneous sample, results indicated the relationship between postpartum anxiety and breastfeeding self-efficacy may have been affecting EBF. Strengthening breastfeeding self-efficacy among women experiencing postpartum anxiety may be a potential strategy to support EBF. Future research should explore these concepts in a more heterogeneous sample.

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CHAPTER ONE

LITERATURE REVIEW

Introduction

Opportunity for establishing good health is key in infancy and there is particularly strong evidence for the role of breastfeeding during this time.¹ Breastfeeding provides many known benefits to mother and infant.² Some major benefits to the mother include reduced risk of ovarian and breast cancer, cardiovascular disease, and type 2 diabetes and for the infant there is reduced risk for necrotizing enterocolitis (NEC), sudden infant death syndrome (SIDS), asthma, diabetes, and obesity.³ The American Academy of Pediatrics (AAP) recommends that infants be breastfed exclusively for the first six months and then along with complementary feeding through the first year, after which breastfeeding may be continued if mutually desired by mother and infant.⁴ The Academy of Nutrition and Dietetics (AND) supports this recommendation⁵ and the U.S. Government includes breastfeeding targets in its Healthy People initiative.⁶ Despite the significant benefits, and the recommendations from leading health authorities, mothers may face multiple barriers to breastfeeding.^{7,8} Therefore, it is necessary to address the barriers that may be keeping mothers from meeting the recommendations and realizing the benefits of breastfeeding. One such barrier that is not yet well understood, but may be relatively common, is that of postpartum anxiety (PPA).⁹

Breastfeeding terminology

The primary measurements for breastfeeding success are initiation, duration and exclusivity of breastfeeding. Breastfeeding duration refers to how long an infant is given breastmilk in any amount, from initiation until the infant is completely weaned off of breastmilk. Exclusive breastfeeding is defined as providing only breastmilk to infants, with the exception of some vitamin and mineral supplements.¹⁰ While breastfeeding exclusively through six months is ideal, breastfeeding in any amount during that time is thought to be beneficial.¹¹ Meeting breastfeeding recommendations is a public health priority, as reflected in the Healthy People 2020 objectives (Table 1).

As seen in Table 1, at the national level, the most difficulty appears to be with meeting objectives for breastfeeding to 6 months, regardless of exclusivity. Upon closer look, different groups within the population vary in their ability to meet most or all of these objectives.¹² For example, some populations, such as black or young mothers, are lagging in overall improvement of breastfeeding rates in the United States.¹³ Returning to work or school, inadequate breastfeeding support, and low maternal breastfeeding self-efficacy continue to act as barriers to breastfeeding despite significant work in these areas.^{7,14} Although most of the Healthy People 2020 objectives have been met at the national level, efforts to support specific subpopulations of women to meet breastfeeding goals should be continued; especially goals to breastfeed exclusively, as exclusive breastfeeding has been shown to increase the benefits of breastfeeding and further reduce the risks of not breastfeeding for both mother and infant.^{11,15}

TABLE 1. RELEVANT HEALTHY PEOPLE 2020 BREASTFEEDING OBJECTIVES AND CURRENT NATIONAL RATES⁶

Objective	Baseline (%)	Target (%)	Current* (%)
Increase proportion of infants who are ever breastfed	74	81.9	83.8
Increase proportion of infants who are breastfed at 6 months	43.5	60.6	57.3
Increase proportion of infants who are breastfed at 1 year	22.7	34.1	36.2
Increase proportion of infants who are breastfed exclusively through 3 months	33.6	46.2	47.5
Increase the proportion of infants who are breastfed exclusively through 6 months	14.1	25.5	25.4
Reduce the proportions of breastfed newborns who receive formula supplementation within the first 2 days of life	24.2	14.2	16.9

*rates collected from National Immunization Survey 2017-2018

Breastfeeding self-efficacy

Maternal breastfeeding self-efficacy, e.g., a mother's belief that she can be successful in reaching her breastfeeding goals, can play a major role in her breastfeeding experiences as well as predict breastfeeding success.¹⁴ Additionally, primiparous mothers are more likely to have a lower breastfeeding self-efficacy than those who have had previous children,¹⁶ which may explain some of why first-time mothers are less likely to be successful in breastfeeding than their multiparous peers. Moreover, breastfeeding self-efficacy has been proposed as a potential pathway through which PPA impacts breastfeeding outcomes.⁹ A recent systematic review of 16 peer-reviewed articles concluded that postpartum anxiety was inversely related to breastfeeding outcomes and found that self-efficacy was a commonly proposed mechanism of this relationship, but that it has not yet been assessed.⁹

Because of the critical relationship between self-efficacy and breastfeeding success, the Breastfeeding Self-Efficacy Scale (BSES) was developed to measure this phenomenon among new mothers and to identify those at risk for discontinuing breastfeeding prematurely.¹⁷ Figure 1 depicts the conceptual framework relating self-efficacy to breastfeeding proposed by Dennis & Faux in 1999.¹⁷ Antecedents, or factors impacting self-efficacy, vary and may be positive or negative. Using the example of performance accomplishments, a breastfeeding mother who has had a positive experience initiating would likely have more breastfeeding self-efficacy than a mother who had difficulty getting her infant to latch. Breastfeeding self-efficacy, whether high or low, has consequences, or responses, that effect the mother's thoughts and feelings. For example,

low breastfeeding self-efficacy may cause a negative view of breastfeeding. Finally, these views can result in different behaviors. For example, a negative view of breastfeeding may result in breastfeeding cessation. This theoretical framework was used in development of the BSES. A few years later, Dennis developed the short form of the BSES (BSES-SF), which condensed the original scale from 33 items to 14 items, with possible scores ranging from 14 to 70¹⁸.

Hinic conducted a descriptive correlational study to examine factors predicting breastfeeding self-efficacy of 107 mothers in the first four days of the postpartum period.¹⁶ The mothers completed questionnaires that included the BSES-short form, as well as the Perceived Stress Scale and the Birth Satisfaction Scale—Revised, to assess how self-efficacy might be related to stress and how mothers felt about the birth experience. For all tools, a higher score indicated a stronger experience of what the tool was designed to measure (e.g., greater breastfeeding self-efficacy, greater postpartum perceived stress, and a greater satisfaction with the birth experience). Hinic's results showed a statistically significant positive relationship between birth satisfaction and breastfeeding self-efficacy ($r=.226$, $p<.05$), indicating that mothers reporting greater breastfeeding self-efficacy also reported being more satisfied with the birthing experience. Additionally, they found a significant positive correlation between BSES scores and mothers' prenatal intentions to breastfeed ($r=.257$, $p<.01$), as well as intention to breastfeed exclusively for 6 months ($r=.454$, $p<.01$). However, there was no statistically significant relationship shown between BSES and perceived stress ($r=-.123$,

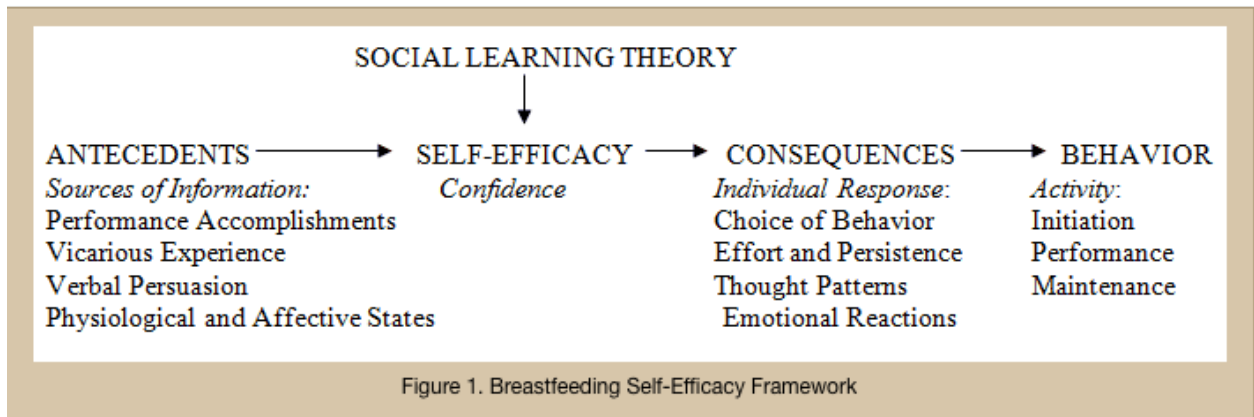


FIGURE 1. BREASTFEEDING SELF-EFFICACY THEORY DEVELOPMENT, ADAPTED FROM DENNIS & FAUX (1999)¹⁷

p-value not reported), indicating that greater breastfeeding self-efficacy may not be protective against experiencing stress in some situations.

To examine the association between breastfeeding self-efficacy and breastfeeding success, Gercek and colleagues conducted a cross-sectional, descriptive study with 303 postpartum women in Turkey.¹⁴ These researchers utilized the BSES-short form and the LATCH breastfeeding assessment tool. The LATCH assessment tool is used to get information on a mother's breastfeeding capabilities with five subscales, represented by each letter of the acronym, as follows: "(L) for how well the baby attaches to the breast, (A) for the number of swallows, (T) for the nipple type, (C) for the maternal comfort grade and (H) for the amount of assistance that the mother requires when holding her baby to her breast".¹⁴ In this population, a weak positive correlation ($r=.29$) was observed between BSES and LATCH scores. Although the correlation was weak, it was statistically significant ($p<.001$) and demonstrates how breastfeeding self-efficacy may affect breastfeeding ability. This evidence provides cause for investigating how self-efficacy may relate to successful breastfeeding.

A study by Wang and colleagues was designed to predict exclusive breastfeeding using a decision tree.¹⁹ Researchers applied a decision tree to predict exclusive breastfeeding through 2 months postpartum in 1,141 women. The first decision branch division was by BSES score, the second division consisted of abnormal nipples, early formula supplementation, mastitis, and neonatal jaundice, and the third division consisted of cracked or sore nipples, intended duration of breastfeeding, and early formula supplementation. Results showed that women with higher BSES scores were significantly

more likely to exclusively breastfeed at four and eight weeks postpartum ($p<.001$). Additionally, they found that women in the highest scoring BSES group, had infants without neonatal jaundice and did not provide early formula supplementation were the group with the highest rate of exclusive breastfeeding at 90.4%.

Henshaw and colleagues conducted a study to explore the relationship between breastfeeding self-efficacy and breastfeeding outcomes²⁰. To do so, they surveyed 142 women at 2 days, 6 weeks, and 6 months postpartum and measured breastfeeding self-efficacy using the BSES short form. They found that high breastfeeding self-efficacy at 2 days postpartum was significantly related to breastfeeding exclusively at 6 months ($p<.05$); however, this relationship did not hold true for exclusively breastfeeding at 6 weeks. Blyth and colleagues conducted a similar study yielding similar results²¹. Their study surveyed 300 women in their third trimester and then again at 1 week and 4 months postpartum, also using the BSES short form to assess breastfeeding self-efficacy. They found that women with higher breastfeeding self-efficacy were more likely to be breastfeeding exclusively at 1 week ($p<.001$) and 4 months postpartum ($p<.001$). Both Henshaw and Blyth concluded that interventions should target raising breastfeeding self-efficacy^{20,21}.

Postpartum anxiety

Postpartum depression (PPD) is one of the most studied areas of postpartum health, especially as it relates to breastfeeding.²² However, postpartum anxiety (PPA), a frequent comorbidity of PPD, is not commonly evaluated as part of a standard prenatal or postpartum visit and is considered to be under-researched.²³ It is important to address this

disparity because PPA may be an important, and possibly modifiable, contributor to poor breastfeeding outcomes.

Recent research, by Nakic Rados and colleagues (2018), found that PPA does occur in the absence of PPD.²³ These researchers administered a survey to 272 women during their third trimester, at two days postpartum, and at six weeks postpartum to assess the relationship between PPD and PPA. None of the women were clinically depressed at the start of the project (an inclusion criterion). The survey consisted of validated tools to assess both PPD and PPA. Participants completed the Edinburgh Postnatal Depression Scale (EDPS) and the State-Trait Anxiety Scale (STAI) at each of the three time points. The EDPS is a 10 item questionnaire to measure depression with a possible score range of 0-30, with a score of 10 or greater indicating possible depression.²⁴ The STAI is a 40 item questionnaire, half of which accounts for state anxiety (e.g., anxiety during a discrete event) and the other half for trait anxiety (e.g., ongoing, chronic anxiety). The possible score ranges from 20 to 80, with scores ranging 20-37 indicating no or low anxiety, 38-44 indicating moderate anxiety, and 45-80 indicating high anxiety²⁵. Of the 61 women reporting elevated depressive symptoms at any of the three time points, 68.9% also reported anxiety symptoms; and of the 56 women reporting elevated anxiety symptoms at any of the three time points, 75% also reported elevated depressive symptoms. This means that, because PPA is not a standard assessment, approximately a quarter of the time, women experiencing PPA are missed because they do not also exhibit PPD.

Aiming to identify women at risk for sustained postpartum anxiety, Dennis conducted a population-based, longitudinal, cross-sectional cohort study with 522 participants.²⁶ Participants were assessed at one, four, and eight weeks postpartum via surveys. Surveys were designed to identify 43 possible risk factors for PPA. Relationships between any of these risk factors and sustained PPA at eight weeks were assessed with multivariable analyses. Results showed that two risk factors were significantly associated with sustained PPA at eight weeks. These were stress ($p < .001$) and social support from the mother's partner at one week ($p = .01$). Additionally, they found that approximately one in eight women experience sustained postpartum anxiety (i.e., reporting anxiety at more than one time point), further indicating that this may be a critical concern during the postpartum period.

In a study by Paul and colleagues, a randomized control trial design was used to examine the effects of PPA on maternal-infant health outcomes using both the STAI and EPDS.²⁷ They conducted interviews at week zero (delivery week) and administered surveys at two weeks, two months, and six months postpartum with 1,123 mothers. Results indicated that greater PPA was statistically significantly associated with a reduction in breastfeeding duration ($p = 0.003$). Additionally, they found that women tested positive for anxiety more frequently than depression at all time points, further indicating that emphasis may need to be put on assessing for PPA throughout the postnatal period. A limitation of this study was that researchers were not able to account for any history of anxiety prior to giving birth and all women participating had intended to breastfeed before being discharged from the birthing hospital.

To assess whether maternal anxiety was a factor for those not exclusively breastfeeding, Arifunhera and colleagues administered the Iowa Infant Feeding Attitude Scale (IIFAS) and Hospital Anxiety and Depression Scale (HADS) to 85 mothers with infants six months or younger in Southern India.²⁸ For the IIFAS, a higher score indicates a more positive breastfeeding attitude and a higher score on the HADS indicates greater anxiety and depression. They found higher scores on the HADS were associated with poorer breastfeeding attitudes, indicating that greater anxiety and depression were associated with poorer breastfeeding attitudes, which according to Dennis & Faux (Figure 1), can result in negative breastfeeding behaviors.¹⁷ However, these findings may not be generalizable to mothers in the United States and more work in this area is warranted.

To further explore the relationship between depression, anxiety, and breastfeeding outcomes, Stuebe and colleagues recently conducted a longitudinal study.²⁹ The research team assessed 206 women through 12 months postpartum, using the STAI to assess anxiety. They found that a score ≥ 40 on the STAI was significantly associated with both formula introduction ($p < .05$) and breastfeeding cessation ($p < .05$). However, the authors noted that the study sample had overall mild anxiety symptoms and that results may differ in women who experience more severe anxiety.

The benefits of breastfeeding exclusivity and duration are well documented, the positive relationship between breastfeeding self-efficacy and breastfeeding success has been observed, and PPA prevalence and associated risks are of increasing interest, especially in relation to breastfeeding success. However, to the PI's knowledge, breastfeeding exclusivity, breastfeeding self-efficacy and PPA, have not been assessed all

together. Moreover, identifying any relationship between STAI scores, BSES scores, and breastfeeding exclusivity could provide significant potential mechanisms for future intervention. Therefore, the overall objective of this study is to explore breastfeeding self-efficacy as a potential pathway through which PPA impacts breastfeeding exclusivity.

Research question & hypotheses:

Does breastfeeding self-efficacy moderate the relationship between postpartum anxiety and breastfeeding exclusivity?

1. H0: There is no relationship between postpartum anxiety and breastfeeding exclusivity.
H1: There is a relationship between postpartum anxiety and breastfeeding exclusivity.
2. H0: Breastfeeding self-efficacy does not moderate the relationship between postpartum anxiety and breastfeeding exclusivity, should this relationship exist.
H1: Breastfeeding self-efficacy does moderate the relationship between postpartum anxiety and breastfeeding exclusivity, should this relationship exist.

CHAPTER TWO

MATERIALS AND METHODS

Study design and participants

Prior to study implementation, the protocol was reviewed and determined to be exempt by the BLINDED FOR REVIEW Institutional Review Board. This was a cross-sectional observational study, conducted via online survey. The survey link was disseminated using social media platforms and by contacting state breastfeeding coalitions to request dissemination to their listservs. Primary eligibility criteria included being a woman (≥ 18 years of age) with an infant between 4 and 24 weeks of age, whom she had breastfed or provided expressed milk to within the last 2 weeks. Secondary eligibility included assignment to one of four anxiety levels, as measured by the Generalized Anxiety Disorder – 7 (GAD-7) scale.³⁰ Responses to this seven-question instrument categorized potential participants into one of the following groups: “no anxiety”, “low anxiety”, “moderate anxiety”, or “high anxiety. Since 50 participants were needed in each anxiety level group for analysis (comparisons between anxiety levels), a secondary eligibility criterion was group assignment.

Survey instrument

The survey instrument included demographic questions and three validated tools, used to assess anxiety, breastfeeding self-efficacy, and postpartum depression. Demographic questions included infant and maternal birthdate (as a secondary eligibility check), maternal race/ethnicity, marital status, prior diagnosis of anxiety or depression

(within 5 years of the birth of referent infant), low-income status (yes or no, as defined by WIC income-eligibility³¹), parity, infant birth weight category (<5lbs, 8oz; between 5lbs, 8oz and 8lbs, 13oz; or >8lbs, 13oz), and whether or not any food or fluid, other than breast milk, had been offered since birth. If any other food or fluid had been introduced, mothers were asked how old their infant was when this occurred. In addition, mothers were asked to indicate the presence of birth or feeding complications, and to describe those if present.

The short form of the State Trait Anxiety Inventory (STAI),³² consisting of 20 questions and possible score range of 0 to 60, was used to assess anxiety. Higher scores indicated higher levels of anxiety. This tool was selected, as it measured both state (temporary/in the moment) and trait (consistently present) anxiety and had been validated in the perinatal population.³³ Each subscale (state and trait) had a possible score range of 0 to 30, with higher scores indicating greater levels of anxiety type.

The short form version of the Breastfeeding Self-Efficacy Scale (BSES-SF)³⁴ was used to assess the breastfeeding self-efficacy of participants, with a possible score range of 14-70 with a higher score indicating higher levels of breastfeeding self-efficacy. The BSES-SF had been validated for use among breastfeeding mothers and was a commonly used tool for assessing breastfeeding self-efficacy.^{34,35}

At the end of the survey, participants could follow a link to a separate survey, and enter a drawing for one of five, \$50 e-gift cards by providing their email address. Aside from this email, no other identifying information was collected. Email addresses were deleted upon receipt of all 5 gift cards.

Data collection

Data collection occurred from October 14, 2019 to January 29, 2020, via online survey platform.

Statistical analyses

Survey responses were downloaded from the online platform, cleaned, and analyzed using SPSS (version 26.0; IBM). Responses were assessed for completion (demographics and at least two of three scales completed), maternal and infant ages were verified by subtracting date of birth from date of survey completion, and implausibility (e.g., maternal age of 1 year). Descriptive statistics characterized the sample and were assessed for variability in responses. Bivariate analyses were conducted, using the appropriate statistical tests (e.g., chi-square for categorical variables; t-tests for continuous variables; correlations for measuring association between continuous variables). Statistical significance was set at $p < 0.05$.

Linear regression was used to predict continuous outcomes and logistic regression was used to predict categorical outcomes. For any relevant regression analyses, the a priori decision was that variables found to be related to the dependent variable in bivariate analyses, but not significantly so (e.g. p-value between 0.06 and 0.1), would be included these analyses. However, because no significant relationship was found between anxiety and EBF, no moderation analysis was conducted. Instead, path analysis was conducted, resulting in a model describing both direct and indirect effects on EBF.

CHAPTER THREE

RESULTS AND DISCUSSION

Results

Of the 472 completed screens, 278 were ineligible (Figure 1). This was either because one or more of the primary inclusion criteria were not met ($n=80$) or the GAD7 group into which they were categorized was full ($n=198$). Of the 194 eligible screens, 173 individuals consented to participate and began the study. Of those 173, 13 were removed for being incomplete (did not complete demographics and at least two of three scales). Age calculation, based on infant and maternal birthdate, resulted in 35 more responses being dropped from analysis due to ineligibility. Therefore, the final sample size was 123.

Descriptive statistics indicated limited variability in maternal race, ethnicity, and relationship status, and in infant birthweight category (Table 1). Both the “no” and “low” anxiety groups reached 50 participants during screening and were subsequently closed to recruitment. However, 13 in each group did not complete an adequate amount of the survey, resulting in only 37 per group. Neither the “moderate” nor the “high” anxiety group was completely populated during data-collection. Those reporting experiencing a birth complication most often reported this to be related to cesarean section (65%). Nearly half of participants reported experiencing a feeding problem at some point during the time they had been breastfeeding (49.2%), with the most common being issues with latch (45%), tongue or lip tie (18%), or both of these (15%). Slightly over half the sample

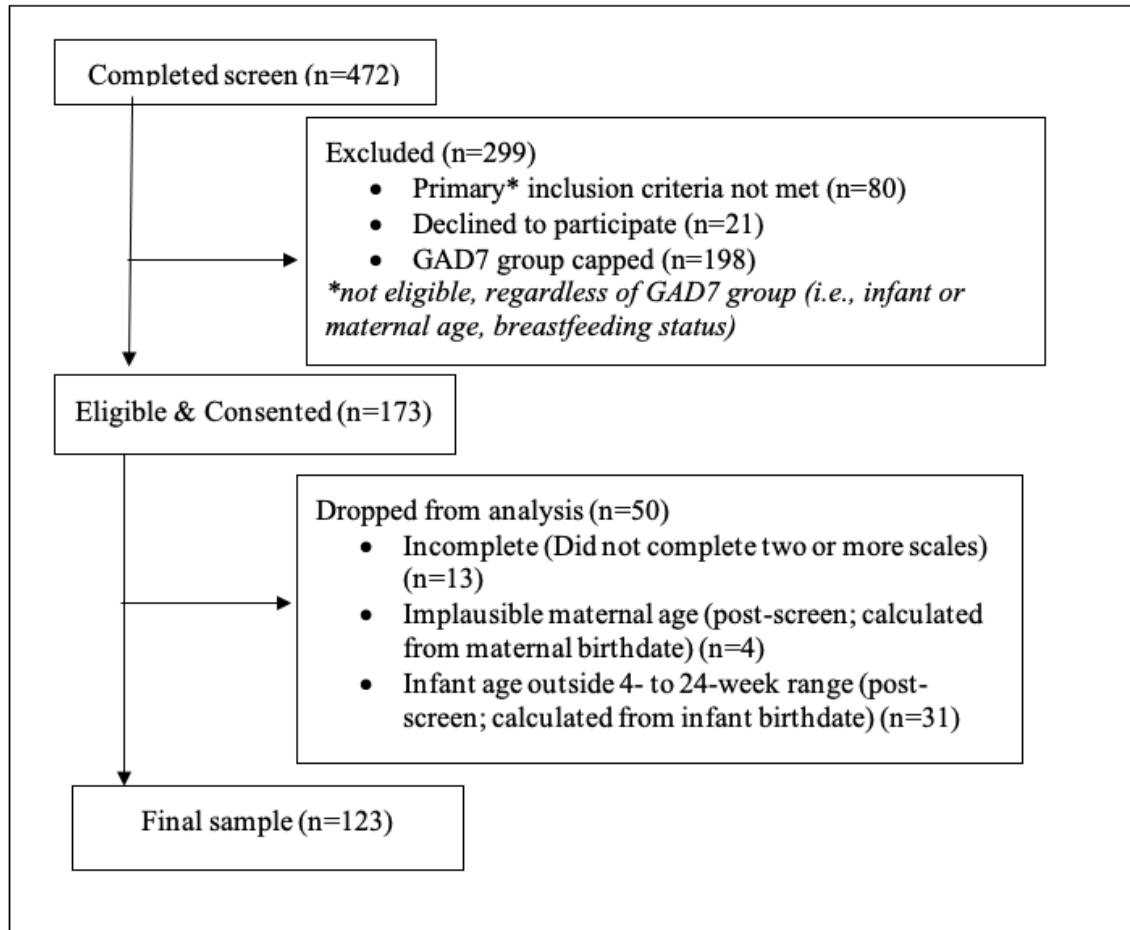


FIGURE 2. PARTICIPANT FLOWCHART SHOWING RECRUITMENT, PARTICIPATION, AND FINAL SAMPLE CREATION

TABLE 2. SAMPLE CHARACTERISTICS OF PARTICIPANTS OF ONLINE SURVEY (N=123)

Characteristic	n (%)
Maternal race	
Asian	1 (0.8)
Black/African-American	1 (0.8)
White/Caucasian	112 (91.1)
Two or more races identified	7 (5.7)
Prefer not to respond	2 (1.6)
Maternal ethnicity	
Non-Hispanic	112 (91.1)
Hispanic	9 (7.3)
Prefer not to respond	2 (1.6)
Maternal relationship status	
Married	93 (75.6)
Single	21 (17.1)
Other	9 (7.3)
Low-income status ^a	
Yes	46 (37.4)
No	77 (62.6)
Primiparous	76 (61.3)
Exclusively breastfeeding at time of survey ^b	75 (60.5)
Experienced ≥ 1 birth complication(s) ^c	37 (29.8)
Experienced ≥ 1 feeding complication(s) ^d	61 (49.2)
Reported receiving a depression diagnosis within past 5 years	34 (27.6)
Reported receiving an anxiety diagnosis within past 5 years	48 (38.7)
Infant birthweight category	
Less than 5 lbs, 8 oz	8 (6.5)
5 lbs, 8 oz – 8 lbs, 13oz	105 (85.4)
More than 8 lbs, 13 oz	10 (8.1)
GAD-7 ^e group	
No anxiety	37 (30.1)
Low anxiety	37 (30.1)
Moderate anxiety	32 (26.0)
High anxiety	17 (13.8)
	Mean (SD)
Maternal age, in years	29 (5.4)
Infant age, in weeks	13 (5.7)
STAI ^f score	
Overall	26 (13.1)
State	12 (7.2)
Trait	14.2 (6.94)
BSES-SF ^g score	56 (11.3)

^aCategorized as “low-income” if income-eligible for the Special Supplemental Nutrition Program for Women, Infants, and Children (e.g., WIC), based on 2019-2020 guidelines³¹

^bDefined as having offered no other foods or fluids.

^cFeeding complications include issues with latch (45%), tongue or lip tie (18%), or both of these (15%) (data not shown)

^dBirth complications most often related to cesarean section (65%; data not shown)

^eGAD7 – Generalized Anxiety Disorder, 7-item scale – possible score range 0-21

^fSTAI – State-Trait Anxiety Inventory – possible score range 0-60

▪ State Anxiety Inventory – possible score range 0-30

▪ Trait Anxiety Inventory – possible score range 0-30

^gBSES -SF – Breastfeeding Self-efficacy Scale – Short Form; possible score range 14-70

(60.5%) reported exclusively breastfeeding (EBF) at the time of survey completion. In terms of overall, state, and trait anxiety, the average was below the median scale score³⁴ Though a higher score on the BSES-SF is generally interpretable as positive, there is no established cut-off, and scores should be interpreted in a sample-specific manner.³⁸

Bivariate analyses revealed no significant relationships between EBF and maternal or infant age, prior diagnosis of depression or anxiety, GAD7 category, reporting one or more birth or feeding complications, parity, infant gender, or low-income status. In addition, no association was found between EBF and postpartum depression (EPDS) or between EBF and overall or STAI subscale scores. However, EBF was significantly related to BSES-SF scores, with those reporting EBF scoring higher on the BSES-SF instrument as compared to those reporting not EBF (59.9+9.89 vs. 51.0+11.12, EBF vs. not EBF, respectively; $p<0.001$) (Table 2). BSES-SF scores were significantly related to having experienced at least one feeding complication, with lower BSES-SF scores associated with reporting a complication (53+12.6 vs 60+8.6, complication(s) vs no complication, respectively; $p<0.001$). EPDS scores were also significantly negatively related to BSES-SF scores, though weakly ($r=-0.292$; $p=0.001$). Overall ($r=-0.18$) and trait ($r=-0.182$) anxiety were also significantly, negatively, and weakly associated with breastfeeding self-efficacy scores ($p<0.05$ for both) (Table 2). However, state anxiety was not significantly related to breastfeeding self-efficacy ($r=-0.151$; $p=0.095$).

TABLE 3. FACTORS ASSOCIATED WITH BREASTFEEDING SELF-EFFICACY SCORES (BSES-SF)^a IN A SAMPLE OF MOTHERS WITH INFANTS BETWEEN 4 AND 24 WEEKS OF AGE (N=123)

Variable	BSES-SF Score Mean (SD)	p-value
Feeding complication(s) ^b		
Yes	53 (12.6)	
No	60 (8.6)	<0.001
Birth complication(s) ^c		
Yes	58 (11.9)	
No	56 (11.0)	0.387
Parity		
Primiparous	55 (11.4)	
Multiparous	58 (10.9)	0.101
Exclusive breastfeeding ^d		
Yes	60 (9.9)	
No	51 (11.1)	<0.001
Prior anxiety diagnosis		
Yes	56 (11.0)	
No	57 (11.5)	0.717
Prior depression diagnosis		
Yes	55 (10.1)	
No	57 (11.6)	0.275
	BSES-SF Score Pearson Correlation	
STAI score ^e overall	-0.18	0.047
State	-0.151	0.095
Trait	-0.182	0.043

^aBSES-SF – Breastfeeding Self-efficacy Scale – Short Form; possible score range 14-70

^bFeeding complications include issues with latch (45%), tongue or lip tie (18%), or both of these (15%) (data not shown)

^cBirth complications most often related to cesarean section (65%; data not shown)

^dDefined as having offered no other foods or fluids

^eSTAI – State-Trait Anxiety Inventory – possible score range 0-60

- State Anxiety Inventory – possible score range 0-30
- Trait Anxiety Inventory – possible score range 0-30

Due to the lack of significant relationship detected between anxiety and EBF, the hypothesized moderating effect of breastfeeding self-efficacy could not be assessed. Instead, path analysis was conducted (Figure 2). The value of the relationship between overall anxiety and breastfeeding self-efficacy is from the correlational analysis ($r = -0.18$). To generate the value of the relationship between STAI and EBF and between breastfeeding self-efficacy and EBF, a logistic regression was performed (Table 3). In this regression, EBF was the dependent variable and STAI and BSES-SF were entered as independent variables. However, to provide a more clearly interpretable model, standardized BSES-SF and STAI scores were used in this regression (increasing differentiation between the two $\text{Exp}(B)$ values). Therefore, the β and the $\text{Exp}(B)$ values in Figure 2 reflect analyses using these standardized variables. The logistic regression model predicted approximately 20% of the variability in EBF ($R\text{-square} = 0.202$; $p = 0.025$) (Table 3). These analyses demonstrate that, while anxiety appears to have no direct impact on EBF in this sample, it may ultimately produce a significant effect when working through breastfeeding self-efficacy.

Discussion

These results add to the limited body of research exploring the relationship between maternal anxiety and exclusive breastfeeding.⁹ The hypothesized relationship between anxiety and exclusive breastfeeding was not detected in this sample of mothers with infants between 4 and 24 weeks of age. Similarly, Tully and colleagues found no

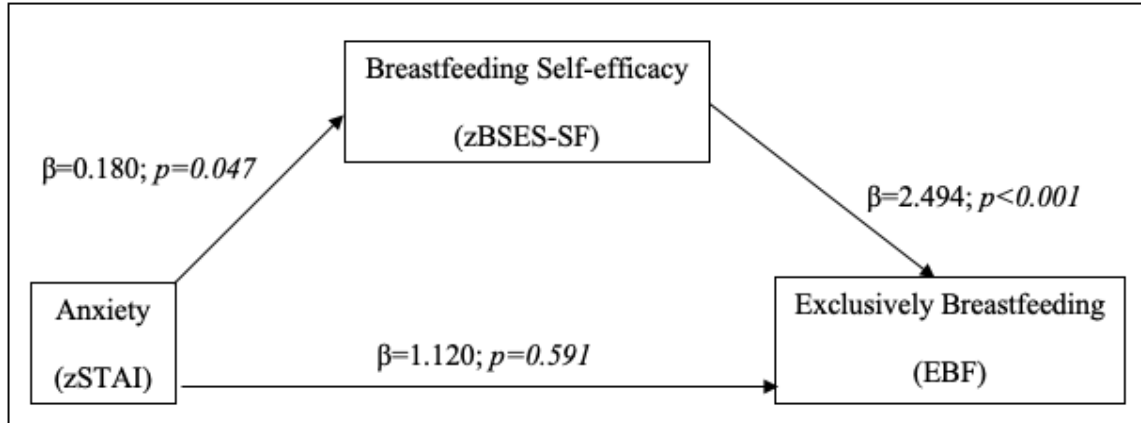


FIGURE 3. PATH ANALYSIS: RELATIONSHIPS BETWEEN ANXIETY, BREASTFEEDING SELF-EFFICACY, AND EXCLUSIVE BREASTFEEDING IN A SAMPLE OF MOTHERS WITH INFANTS BETWEEN 4 AND 24 WEEKS OF AGE (N=123)

TABLE 4. LOGISTIC REGRESSION: PREDICTING EXCLUSIVE BREASTFEEDING FROM BREASTFEEDING SELF-EFFICACY AND ANXIETY SCORES AMONG A SAMPLE OF WOMEN WITH INFANTS AGED 4 TO 24 WEEKS (N=123)

Independent Variable*	B	SEB	Wald	p-value	Exp(B)
zBSES-SF ^a	0.914	0.228	16.085	<0.001	2.494
zSTAI total ^b	0.113	0.210	0.289	0.591	1.120
					R square = 0.202 p=0.025

^aBSES-SF – Breastfeeding Self-efficacy Scale, short form – possible score range 14-70

^bSTAI – State-Trait Anxiety Inventory – possible score range 0-60

*z scores used for regression

relationship between anxiety and EBF at 1 month of age among mothers of term infants (n=51).³⁶ Though similar in infant age, their sample was more variable in terms of race/ethnicity (e.g., 49% White, non-Hispanic) and reported lower levels of EBF (34.9%), which limits the ability for comparison. Importantly, these researchers only assessed state anxiety, so no conclusions can be drawn in terms of the relationship between EBF and overall or trait anxiety. Comparing the Tully and colleagues state anxiety results (25.1+3.5; full 20-item STAI subscale) with those of the current sample indicate both groups scored below the subscale midpoint. This may indicate relatively low levels of state anxiety in both samples, and potentially a reduced ability to detect any differences in EBF.

Others have found strong relationships between anxiety and breastfeeding exclusivity.⁹ For example, Flaherman and colleagues, in secondary analysis of a cohort of 1,107 infants, exploring early infant weight loss, maternal anxiety, and breastfeeding duration, found a significant negative relationship between postpartum anxiety and EBF at 2 weeks of age and any breastfeeding at 2 and 6 months of age (exclusivity was not explicitly reported at the latter two time points).³⁷ In their sample, state anxiety was measured at 2 weeks postpartum and was below the scale midpoint (STAI state scale; 20-items). Though similar in scoring to our sample, in terms of being below the midpoint, the relationship with EBF was found in their sample but not in ours. This may be a function of infant age, with mothers in the Flaherman sample being in, or newly emerging from, the milk-supply establishment period. It is possible that EBF during this time period is more sensitive to state anxiety, but this would need further investigation.

In this sample, breastfeeding self-efficacy was the only measured factor positively associated with EBF, even after accounting for the negative relationship between self-efficacy and overall anxiety. This may indicate breastfeeding self-efficacy could provide a buffer between overall anxiety and EBF. However, the lack of relationship between transient (e.g., state) anxiety and breastfeeding self-efficacy could indicate breastfeeding self-efficacy may play less of a role during momentary, acutely stressful situations. One other study that conducted path analysis found psychological factors such as postpartum depression and postpartum anxiety impacted exclusive breastfeeding duration through breastfeeding self-efficacy.³⁸ The finding by Brockway and colleagues, in their 2017 review and meta-analysis of the effect of increasing breastfeeding self-efficacy on breastfeeding duration and exclusivity, that interventions were most successful when self-efficacy strategies addressed the unique needs of the mother may provide support for developing BSE strategies specific to mothers experiencing transient anxiety.

The methods of this study were consistent with other studies with similar aims. However, a limitation of the present study was the lack of multiple assessment points.^{20,21,29} Anxiety is likely a fluid experience, as measured by the state portion of the STAI, so while this study may have accurately assessed trait anxiety, fluctuations in state anxiety were not captured using this study design. Use of the STAI to assess anxiety^{23, 27, 29} and the BSES-SF^{14,20} to assess breastfeeding self-efficacy appears to be standard across studies exploring relationships between maternal mood and breastfeeding outcomes.³⁹ Future work, measuring the relationships between state anxiety, breastfeeding self-

efficacy, and breastfeeding exclusivity would be strengthened by the use of a longitudinal study design.^{23,40}

This study supports research showing a significant relationship between breastfeeding self-efficacy and breastfeeding exclusivity. While the present study did not find significant relationships between anxiety and breastfeeding exclusivity, directly, the results and prior research provide support for continued exploration of how breastfeeding self-efficacy may buffer this relationship.

Limitations

A larger sample size may have allowed for more significant relationships to be observed. However, it is more likely that increasing variability in maternal characteristics, such as relationship status and/or birth complications, could reveal important differences in any relationships between maternal anxiety, breastfeeding self-efficacy, and optimal rates of EBF. Future research projects should make every effort to increase such variability.⁴¹ As a cross-sectional study, data from only one time point were collected and assessed, and only associations may be provided. It is likely state anxiety, breastfeeding self-efficacy, and breastfeeding practices are quite fluid, and a longitudinal study design could increase the strength of findings. In addition, path-analysis did not include consideration for confounding variables, such as feeding complications, which may change how anxiety impacts exclusive breastfeeding behavior. Finally, many variables were not assessed (i.e. health & lactation care access, social support) here that should be explored in future research.

CHAPTER FIVE

CONCLUSION

In this sample, breastfeeding self-efficacy was a significant predictor of exclusive breastfeeding. While postpartum anxiety did not have a direct effect on exclusive breastfeeding, it did have an indirect effect through breastfeeding self-efficacy. As such, this study supports that interventions focused on raising self-efficacy may be effective for assisting women experiencing anxiety in reaching their exclusive breastfeeding goals.

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APPENDICES

Appendix A. Consent for Research Participation

Research Study Title: Postpartum Anxiety, Breastfeeding Self-Efficacy and Breastfeeding Outcomes

Researcher(s): Rachel Klenzman, BS, Katie Kavanagh, PhD, RD, University of Tennessee, Knoxville

You must be age 18 or older to participate in the study. The information in this consent form is to help you decide if you want to be in this research study. Please take your time reading this form and contact the researcher(s) to ask questions if there is anything you do not understand.

Why is the research being done?

The purpose of the research study is to better understand the relationship between anxiety, self-efficacy, and breastfeeding outcomes in postpartum mothers who are breastfeeding.

What will I do in this study?

If you agree to be in this study, you will complete an online survey. The survey includes questions about anxiety, breastfeeding, education, marital status, and more, and should take you about 20-30 minutes to complete.

Can I say “No”?

Taking the survey is completely voluntary and you may stop at any time. After you submit the survey, we cannot remove your responses because we will not know which responses came from you.

Are there any risks to me?

Possible risks include possible loss of privacy, but this is extremely unlikely because your name will not be associated with your survey responses. Additionally, you may feel some discomfort when answering questions about anxiety and breastfeeding; resources will be provided to you to help minimize discomfort.

Are there any benefits to me?

We do not expect you to benefit from being in this study but your participation and the findings from the study may help inform future healthcare practices for breastfeeding mothers.

What will happen with the information collected for this study?

The survey is anonymous, and no one will be able to link your responses back to you. Your responses to the survey will not be linked to your computer, email address or other electronic identifiers. Please do not include your name or other information that could be used to identify you in your survey responses. Information provided in this survey can

only be kept as secure as any other online communication. Information collected for this study will be published and possibly presented at scientific meetings.

Will I be paid for being in this research study?

Although you will not be compensated for completing this survey, you may choose to click on a link to enter a drawing to receive one of five fifty dollar (\$50) electronic Amazon gift cards. Anyone age 18 and over may enter the drawing even if they do not participate in the research. The odds of winning the drawing are approximately 1 in 40. Gift card recipients will be randomly selected within one week of the close of the study. Gift cards will be emailed to winners within two weeks of the close of the study.

Who can answer my questions about this research study?

If you have questions or concerns about this study, or have experienced a research related problem or injury, contact the researcher, Rachel Klenzman at rklenzma@vols.utk.edu or (614) 312-9426.

For questions or concerns about your rights or to speak with someone other than the research team about the study, please contact:

Institutional Review Board
The University of Tennessee, Knoxville
1534 White Avenue
Blount Hall, Room 408
Knoxville, TN 37996-1529
Phone: 865-974-7697
Email: utkirb@utk.edu

Statement of Consent

I have read this form, been given the chance to ask questions and have my questions answered. If I have more questions, I have been told who to contact. By clicking the “I Agree” button below, I am agreeing to be in this study. I can print or save a copy of this consent information for future reference. If I do not want to be in this study, I can close my internet browser.

Appendix B. Recruitment Flyer

Breastfeeding & Anxiety Research Study

The University of Tennessee's ICAN Thrive Lab in the Department of Nutrition is doing a study to learn more about breastfeeding experiences and practices among women who experience anxiety.

If you are 18 years or older, have a baby that is 4 to 24 weeks old, have breastfed, and have experienced any anxiety, you may be eligible to participate in this online survey. To see if you are eligible to participate, please click [here](#).

The survey may take about 30 minutes to complete and all participants can be entered into a drawing for one of five \$50 Amazon gift cards.

If you have questions regarding the study, please contact the investigator, Rachel Klenzman, at ican@utk.edu or 865-974-2109, in the University of Tennessee's Department of Nutrition.

VITA

Rachel grew up in Pickerington, Ohio. She graduated from Ashland University in Ashland, Ohio with a Bachelor of Science in Dietetics in 2018. During her undergraduate years, Rachel worked as a research assistant on a variety of research studies at Nationwide Children's Hospital in Columbus, Ohio, where her interest in maternal and child health was sparked. She decided to pursue a dual MS-MPH degree at the University of Tennessee, Knoxville (UTK), where she had the privilege of serving as a funded Maternal and Child Health Nutrition Leadership trainee for two years. Upon completing coursework, Rachel is also completing the dietetic internship through UTK and will sit for the registration examination to become a registered dietitian nutritionist after graduation.