BREASTFEEDING SELF-EFFICACY IN WOMEN USING ASSISTIVE TECHNIQUES AND DEVICES TO ADDRESS MATERNAL AND INFANT FEEDING PROBLEMS

by

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This dissertation used the theory of planned behavior (Ajzen, 1991, 2002) and breastfeeding self-efficacy theory (Dennis, 1999) to explore relationships among breastfeeding self-efficacy and both the source and intensity of breastfeeding problems and perception of frequently used assistive techniques and devices for breastfeeding. Phase One was a qualitative, descriptive study with eight postpartum women to examine beliefs and decision-making about using a breast pump. Themes constructed to re-present the participant responses were: "Resource gathering", "Intention forming", and "Behavior navigating". Reliance on product websites and trust in online peer reviews characterized pump selection. Negotiating privacy, scheduling, and pumping necessity illustrated discussions of maternal needs at places of employment. There were minimal references to pump and milk collection safety.

Phase Two used a descriptive, longitudinal, correlational survey design with 125 women who were surveyed in the first few days following birth and reassessed after 2 weeks. The perception of problems originating from either a maternal source or arising equally from a maternal and infant origin was associated with lower mean breastfeeding self-efficacy (BSE) scores on the Breastfeeding Self-Efficacy Scale – Short Form (BSES-SF). The lowest mean BSE scores were noted in women reporting a higher intensity of breastfeeding problems, and only

modest improvements in BSE were noted by the time of the follow up survey. There was no relationship between BSE and the perceived level of personal assistance needed to overcome problems. Decreased BSE from the initial to the follow up survey was noted in women who used six or more techniques and devices to overcome breastfeeding challenges. Breastfeeding self-efficacy is a modifiable attribute for nurses and lactation specialists to consider when designing programs to support breastfeeding mothers and to mitigate early weaning since high breastfeeding self-efficacy has been shown to extend breastfeeding exclusivity and duration.

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DEDICATION

To Mark, Annah, Abby, mom (Pat), dad (Ray), and Marie who have all been steadfast in their love, support, and efforts to keep me steadily moving forward on this journey.

To the mothers and babies who inspire me. My hope is that my current and future research helps you navigate and sustain the breastfeeding relationship.

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Côté-Arsenault showed me how I could tell a mother's story through qualitative research, and Amber Welborn went ahead of me to pave the way. Lynne Lewallen, Kelly Stamp, Heidi Krowchuk, Debra Wallace, and Robin Remsburg offered strategies and role modeling for charting my future in academia. I knew Steve Tuck was going to check in on me every week and keep my spirits lifted high! Finally, Kay Cowen, Deb Stanford, and Tammy Hall have been by my side to make sure my nursing students had everything they needed when I was pulled in different directions. My co-workers have truly been my anchor!

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CHAPTER 1: INTRODUCTION

Background and Significance

Although 84.1% of women initiate breastfeeding in the United States (U.S.) on the first postpartum day, only 63.6% are providing human milk exclusively by day seven (Centers for Disease Control and Prevention [CDC], 2018, 2020a). Breastfeeding challenges are reported by up to 92% of new mothers with problems peaking in the first postpartum week (Demirci & Bogen, 2017; Wagner et al., 2013). Common breastfeeding problems include difficulty with infant latch, breast and nipple pain, limited experience with breastfeeding, and perceived low milk supply (Colombo et al., 2018; Feenstra et al., 2018; Kent et al., 2016). Nurses and lactation professionals collaborate closely with women in the early postpartum period to promote breastfeeding and address complications to achieve feeding goals. The current nutritional recommendation by the American Academy of Pediatrics (AAP) Section on Breastfeeding is for infants to exclusively receive human milk for the first six months of life and then continue to do so as complementary foods are introduced at least until the child reaches the age of one year, and as mutually desirable thereafter (Eidelman & Schanler, 2012). This statement is affirmed by other national organizations such as the American College of Obstetricians & Gynecologists (ACOG, 2018) with the recommendation expanded to two years by international organizations including The World Health Organization (WHO; 2017) and the United Nations Children's Fund (UNICEF; 2003).

Human milk is the ideal, species-specific source of nutrition throughout and beyond the first year of life. Initially, IgA, lactoferrin, and oligosaccharides in colostrum boost immunity and promote an optimal neonatal intestinal microbiota (Bardanzellu et al., 2017; Gopalakrishna & Hand, 2020). Human milk offers protection against severe respiratory infections and decreased

morbidity from diarrheal diseases in infants and young children (Horta & Victoria 2013), and a reduction in otitis media in the first two years of life (Bowatte et al., 2015). Females also experience cumulative benefits of breastfeeding such as a 4.3% reduction in breast cancer for each 12 months of breastfeeding, decreased incidence of ovarian cancer, and a 32% reduced risk of developing type-2 diabetes (Chowdhury et al., 2015). Conversely, a shorter duration of breastfeeding correlates with increased risk of postpartum depression (Stuebe, 2009).

When infant formula is introduced for poor infant weight gain or problems with maternal milk supply, a decrease in the duration of human milk feedings is seen among mothers initially intending to exclusively breastfeed (Chantry et al., 2014). A similar pattern of decreased duration of the provision of human milk is seen with the use of a nipple shield (Kronborg et al., 2017) and a breast pump (Bream et al., 2017; Felice et al., 2016; Yourkavitch et al., 2018). Additionally, first-time mothers have been found to be more likely than women with subsequent children to initiate use of a breast pump within the few days following birth (Loewenberg Weisband et al., 2017). The introduction of devices into an infant feeding plan of care prompts increased collaboration between parent and provider in accordance with Core Competencies in Breastfeeding Care and Services for All Health Professionals (U.S. Breastfeeding Committee, 2010). However, mothers lament that instructions by health professionals are often confusing, inconsistent, and heighten anxiety about milk production (Dietrich Leurer et al., 2020; Flaherman, Hicks, Huynh et al., 2016, Jefferson & Bibb, 2019). To achieve maximum health benefits from the expression and receipt of human milk, a greater understanding is needed about interventions offered to new mothers in the early postpartum period and the subsequent impact on a mother's confidence in her breastfeeding abilities.

Previous studies have shown predictability of breastfeeding intentions and duration based on various concepts within the theory of planned behavior (TPB; Guo et al., 2016; Johnson-Young, 2019; Lau et al., 2018). Specifically, self-efficacy, identified within the TPB as a component of perceived behavioral control is a modifiable factor to increase intention to breastfeed and sustain breastfeeding behavior (Chan et al., 2016; Glassman et al., 2014). The Academy of Breastfeeding Medicine encourages assessment and behavioral interventions to promote self-efficacy of breastfeeding (Rosen-Carole & Hartman, 2015) since higher baseline self-efficacy as well as targeted interventions to increase breastfeeding self-efficacy (BSE) increase the rate and duration of exclusive breastfeeding (De Roza et al., 2019; Piro & Ahmed, 2020; Shiraishi et al., 2020). Both maternal and infant contributions to the breastfeeding dyad are essential to ensure a robust milk supply for infant growth and development, and few studies have explored BSE differences based on the mother's perception of whether problems originate with the infant, herself, or are a shared burden.

Although James et al. (2020) noted that having initially high BSE aids in overcoming breastfeeding challenges, self-efficacy is lower when women experience breastfeeding problems (Aghdas et al., 2014; Hinic, 2016). The use of an assistive technique or device to intervene for breastfeeding problems has independently been shown to contribute to decreased BSE and early breastfeeding cessation (Feenstra et al, 2018; Keemer, 2013). The effect on BSE as the feeding plan to address breastfeeding problems becomes increasingly complex with multiple interventions has not been well studied. The paucity of studies investigating the effects of the origin of complications and their corresponding treatment regimens for breastfeeding problems on BSE and feeding intentions indicates more research is needed in this area (Feenstra et al., 2018; Zhu et al., 2017).

Purpose of the Study

The purpose of this study was to investigate how the mother's perception of problems in the early postpartum breastfeeding experience and the techniques and devices to address those problems influenced maternal BSE, feeding intentions, and breastfeeding behavior in a sample of mothers providing human milk to healthy, term newborns. As a precursor, a pilot study was conducted to explore beliefs and decision-making processes associated with breast pump use in first-time mothers providing full or partial human milk feedings to healthy, term newborns at 24-72 hours after birth. The pilot study examined maternal comfort level and knowledge about breast pumps as one of the most common assistive devices employed throughout postpartum.

Research Aim and Research Questions

Research aim: To investigate how a mother's perception of problems in the early postpartum breastfeeding experience and the techniques and devices to address those problems influence maternal BSE, feeding intentions, and breastfeeding behavior in a sample of mothers providing human milk to healthy term newborns.

Research questions and sub-questions:

1. What is the relationship between a mother's perception of the origin of breastfeeding problems and BSE?
    a. What is the relationship between maternal perception of the *source* of breastfeeding problems and BSE?
    b. To what extent does a mother's perception of the *intensity* of breastfeeding problems influence BSE?
2. To what extent do the techniques and devices to address breastfeeding problems influence BSE?

    a. What is the relationship between a mother's perception of *personal assistance* needed to overcome breastfeeding problems and BSE?
    b. Does a mother's perception of the *quantity of assistive techniques and devices* introduced to treat breastfeeding problems influence BSE?
3. Does the relationship among perceived intensity of breastfeeding problems, intensity of personal assistance, and quantity of assistive techniques and devices to address breastfeeding problems influence BSE?
4. Does the relationship among perceived intensity of breastfeeding problems, intensity of personal assistance, and quantity of assistive techniques and devices to address breastfeeding problems influence a mother's current breastfeeding behavior and future infant feeding intentions?

Conceptual Framework

The TPB (Ajzen, 1991) is insightful when investigating the relationship between maternal breastfeeding self-efficacy and feeding patterns and intentions when maternal or infant complications in the feeding relationship are encountered. The TPB has previously been used as the basis for educational, health care, and psychological research for evaluating behavior trajectories following treatment modalities and instructional offerings (Lau et al., 2018; Riebl, et al., 2015; Senkowski et al., 2019). Specific to breastfeeding, the TPB has been utilized in descriptive, quantitative, and implementation research (Bartle & Harvey, 2017; Lau et al., 2018; Johnson-Young, 2019; Zhang et al., 2009). The TPB along with Dennis's (1999) breastfeeding self-efficacy framework formed the theoretical basis for this research.

Theory of Planned Behavior

Behavioral, normative, and control beliefs in the TPB model influence attitudes, subjective norm, and perceived behavioral control respectively to moderate intentions to engage in specific behaviors. Attitudes toward behavior and subjective norm were the original antecedents to intention and subsequent behavior in the theory of reasoned action (Ajzen & Fishbein, 1980). This theory was extended to become the TPB with the inclusion of control beliefs influencing perceived behavioral control (PBC) as a third salient concept (Ajzen, 1991).

Positive or negative attitudes toward a behavior are prompted by behavioral beliefs encompassing an individual's appraisal of the benefits and anticipated outcomes of a behavior (Ajzen, 1991). In the application of the TPB model to the breastfeeding process, behavioral beliefs include a mother's thoughts about the maternal and infant health consequences of breastfeeding and her perception of the value of human milk versus infant formula (Dennis, 1999).

The subjective norm develops from the normative beliefs or weight ascribed to the opinions of others toward behavior (Ajzen, 1991). Whether or not influential people in an individual's life have engaged in the behavior has strong bearing on the subjective norm as well. Subjective norms include perceptions of expectations and social pressure from family, friends, co-workers, media, healthcare professionals, and the predominant culture (Ajzen, 1991).

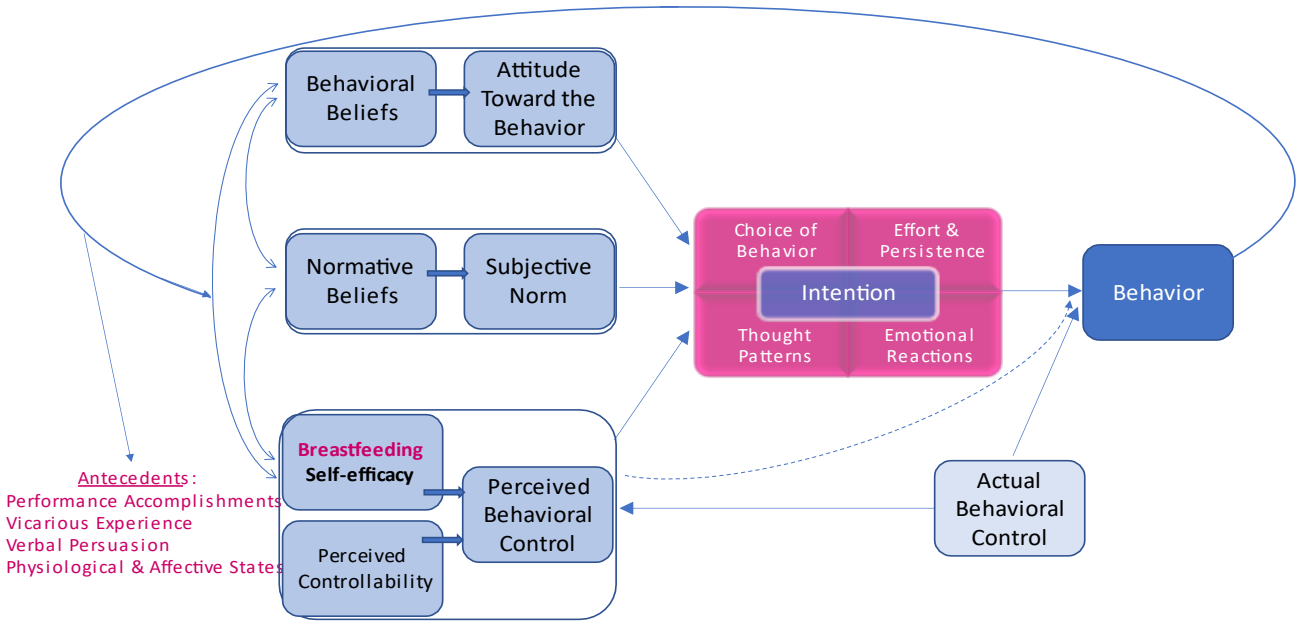
In the original TPB model (Ajzen, 1991), perceived behavioral control arises from control beliefs about the perception of factors that could either help or hinder performance of the behavior. Ajzen (2002, 2020) further clarified and provided evidence of PBC as a two-factor model including self-efficacy and perceived controllability. When applied to breastfeeding beliefs and decision-making, PBC is a product of self-efficacy, or a woman's confidence in her

ability to be successful at the task of breastfeeding, and controllability, or the perception of the level of control she has over success at the behavior within her present or anticipated state.

As indicated by directional arrows between and among factors influencing intention in Figure 1, beliefs influence intention and subsequent likelihood of performance of a behavior. The solid arrow between perceived behavioral control and intention in Figure 1 reflects empirical research indicating perceived behavioral control works in concert with attitude toward behavior and subjective norm to moderate intention (Ajzen, 2002). A broken arrow in Figure 1 illustrates that PBC also independently accounts for a proportion of variance in behavior (Ajzen, 2002; Conner et al., 2002).

Figure 1

BSE Theory Superimposed on TPB framework.



Note. Adapted from "Behavioral Interventions Based on the Theory of Planned Behavior," by I. Ajzen, 2006, *Research Gate*, p. 2 (https://www.researchgate.net/publication/245582784_Behavioral_Interventions_Based_on_the_Theory_of_Planned_Behavior). Copyright 2006 by Icek Ajzen. & "Theoretical Underpinnings of Breastfeeding Confidence: A Self-efficacy Framework," by C-L. Dennis, 1999, *Journal of Human Lactation*, *15*(3), p. 197 (https://doi.org/10.1177/089033449901500303). Copyright 1999 by the International Lactation Consultant Association.

Behaviors can be predicted when people have intention as well as both perceived behavioral control and actual control over the behavior (Ajzen, 1991, 2006). A person may have confidence in the ability to perform a particular behavior yet have constraints that limit the opportunity to successfully perform the behavior. The opposite is also true when there is limited confidence in ability, but external factors support and lead to the successful completion of the behavior. The construct of *actual behavioral control* is positioned between perceived behavioral control and behavior in the theoretical model of the TPB. The directional arrows in Figure 1 represent external mechanisms such as costs or resource availability moderating both PBC and the ability to perform the behavior. Once the behavior is performed, both Ajzen (2020), through clarifications of the theory, and Dennis (1999) recognize a feedback loop returning from behavior to beliefs and antecedents for repeated performance or abandonment.

Ajzen (1991) developed the TPB with the assumption that individuals have complete volitional control over some behaviors, yet other behaviors are constrained by factors such as time, resources, opportunities, and a requisite skill set. In the postpartum breastfeeding dyad, an individualized plan detailing processes and times for milk expression as well as various physical

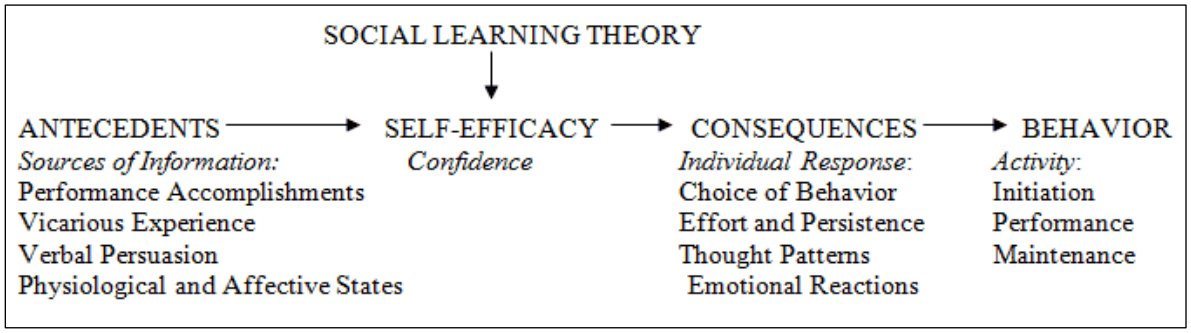
and technological means to enhance milk supply or latch are introduced when there are feeding challenges. Gollwitzer (1999) referred to this nursing plan of care prescribing when and how to perform the behavior as an implementation intention. Ajzen (2006) recognized that implementation intention should bolster actual behavioral control and improve the possibility of mastery behavior. This aligns with assumptions of self-efficacy theories (Bandura, 1977; Dennis, 1999) that cognitive processes can lead to real behavior change and that repeated effective performance of a behavior can progress to mastery. However, a directional arrow in the conceptual model (Figure 1) leading from actual behavioral control back to perceived behavioral control indicates self-efficacy can be affected positively or negatively by external plans and resources (Ajzen, 2006).

Breastfeeding Self-Efficacy Theory

Dennis (1999) developed a theoretical framework for self-efficacy in the context of breastfeeding based on Bandura's (1977) concept of self-efficacy. Self-efficacy is a person's confidence in their ability to align their thoughts and emotions, motivations, resources, and social environment for the purpose of performing a specific behavior; it is the perception that one can achieve and sustain a task (Bandura, 1977). The breastfeeding self-efficacy (BSE) theory (Figure 2) explains the role and prediction models of self-efficacy in breastfeeding intent, initiation, and efforts toward the provision of human milk exclusively (Alghamdi et al., 2017; Hinic, 2016; Pollard & Guill, 2009; Wu et al., 2014; Yang et al., 2016). Self-efficacy theories (Bandura, 1977; Dennis 1999) have the assumption that self-efficacy influences a person's ability to initiate and use coping mechanisms. These theories explain "how much effort people will expend and how long they will persist in the face of obstacles and aversive experiences" (Bandura, 1977, p. 194) to maintain their intentions for performance.

Figure 2

Breastfeeding Self-Efficacy Theory



Note. From "Theoretical Underpinnings of Breastfeeding Confidence: A Self-efficacy Framework," by C-L. Dennis, 1999, *Journal of Human Lactation, 15*(3), p. 197 (https://doi.org/10.1177/089033449901500303). Copyright 1999 by the International Lactation Consultant Association.

There are four important antecedents of self-efficacy (Figure 1): performance accomplishments, vicarious experience, verbal persuasion, and physiologic and affective states (Bandura, 1977). An assumption is that these antecedents are continually revisited and reevaluated as breastfeeding is performed up to 12 times a day in the early weeks of an infant's life.

Performance accomplishments recognize past successes or failures of a behavior. Bandura (1977) and Dennis (1999) both noted that previous performance is influential because repeated past failures can significantly lower the perception of mastery possibility. The cyclical nature of breastfeeding behavior and performance accomplishments is especially applicable in the early postpartum period because of the steep learning curve of breastfeeding the first infant or learning subtleties in the feeding patterns of subsequent children. Additionally, the perceived

intricacy of the task, anticipated assistance needed, and experience with past failures are manifested in the performance accomplishment antecedent (Bandura, 1977; Dennis, 1999).

Vicarious experiences of having seen others breastfeed, exposure to feeding images online, and attending a class where breastfeeding technique was modeled are antecedents to BSE. An additional antecedent, verbal persuasion, occurs when either positive or negative appraisal of the behavior by family, peers, or professionals impacts perceived abilities (Dennis, 1999). Having few people that encourage breastfeeding within a community can hinder breastfeeding while social support from friends and family or health care providers can overcome perceived barriers and facilitate confidence in breastfeeding (Schindler-Ruwisch et al., 2019)

The physical or affective state during the time surrounding a feeding or in response to the feeding can impact breastfeeding self-efficacy. For example, fear of or anticipated maternal pain with feeding may decrease self-efficacy, whereas maternal and infant bonding along with the soothing effects of oxytocin release (Niwayama et al., 2017) may increase perceived behavioral control and confidence.

BSE theory enhances the TPB through a more detailed explanation of intention (Figure 1). Processes related to intention are: 1) choice of behavior, 2) effort expenditure and persistence, 3) thought processes, and 4) emotional reactions (Dennis, 1999). Choice of behavior involves setting goals and establishing a degree of commitment to maintain intentions. The ability to endure setbacks and recommit with persistence as well as anticipate new tasks for their potential reward rather than react with doubt and anxiety are essential components of intention. Finally, thought processes of visualizing success are reported to help maintain analytic reasoning as opposed to responding purely through emotion (Dennis, 1999).

Self-efficacy has been examined as a modifiable factor in intervention studies leading to sustained intention of and perseverance with breastfeeding behaviors in the postpartum period (Bandura, 1977; Otsuka et al., 2014; Shiraishi et al., 2020; Wu et al., 2014). In this study, self-efficacy theories, specifically the application of BSE theory contributed to the depth of understanding of the perceived behavioral control construct as well as intention as a precursor to behavior in the TPB. Predictive power of the TPB shows how alterations in perceptions of ability and control over aspects of breastfeeding alter the strength of intentions for exclusive breastfeeding and plans for the duration of breastfeeding.

Philosophical Underpinnings

Crotty (1998) uses the term constructivism to describe the view that meaning is generated in social contexts and in interaction with the world. Constructivism asserts that reality for a breastfeeding mother is dependent on the social, historical, economic, and emotional context within which feeding intentions are formed and breastfeeding behavior is initiated and maintained. The mother, through reciprocal interaction with the newborn, has patterns of behavior and thought that are progressively transformed through the breastfeeding relationship. Factors affecting her perceived and actual behavioral control are unique in timing and context and are worthy of study by nurse scientists to understand and determine factors that correlate with the initiation and maintenance of breastfeeding.

Due to the subjective nature of belief patterns, a social constructivist paradigm, also referred to as interpretivism, with a relativist ontology underpins the TPB (Mack, 2010; Salvadore, 2016). Creswell and Creswell (2018) note that Lincoln and Guba's *Naturalistic Inquiry* published in 1985 was instrumental in shaping the defining elements of the constructivist worldview, as were the historical writings of Weber and Kant (Polit & Beck, 2017). A relativist

ontology recognizes that reality is mentally constructed, subjective, and dynamic (Polit & Beck, 2017), which aligns with the constructivist paradigm where meaning-making by individuals is varied and complex. Interpretivism originated in the social sciences. It purports that individuals analyze the knowledge they have constructed and interact with the social world around them based on their judgements of their constructed reality. Although interpretations are subjective, the researcher working in an interpretivist paradigm can still objectively investigate trends and quantify variables for various samples leading to discovery and descriptions of social phenomena (Mack, 2010; Salvadore, 2016).

Also aligning with the constructivist paradigm is the context-dependent nature of the TPB, although an assumption of the theory is that people have the resources and emotional state and stability to proceed through the model constructs to attain the behavior. It is possible to quantify patterns for various demographics, investigate how various antecedents such as past experiences influence the functionality of the theory, and make predictions about movement and decision-making within the theory. For these tasks, an etic perspective forms the epistemological basis. Deductive processes of hypothesis testing with a goal of generalizing findings to a larger population can be employed. Qualitative methods are commonly used in research in the constructivist paradigm. However, survey methodology with closed and open-ended questions may also gather the participants' quantifiable subjective meaning of their experiences. Nursing can incorporate the TPB in studies of human behavior with the knowledge that it was developed by a social psychologist (Ajzen, 1991), is based on cognitive behavioral principles (Bandura, 1977), and is congruent with the constructivist paradigm.

Theoretical and Operational Definitions

Breastfeeding Self-Efficacy

Self-efficacy is conceptually defined as a person's perception of their ability to accomplish a task or produce a desired effect and incorporates their motivation and cognitive processes (Bandura, 1977). In this study, self-efficacy was described in the context of perceived breastfeeding skill and ability. It is the central construct in the BSE theory (Dennis, 1999), as well as a key construct in the TPB. Self-efficacy was operationalized in this research study by the Breastfeeding Self-Efficacy Scale – Short Form (BSES-SF) by Dennis (2003). This 14-item scale was administered within the first few days postpartum and again at 2 weeks postpartum.

Early Postpartum

The focus of this research was the early postpartum time frame where the most rapid changes in the breast and infant feeding occur. This is operationally defined as the time of initiation and early infant feeding in the days after birth during lactogenesis II to approximately two to three weeks postpartum in early lactogenesis III as feeding patterns become established.

Breastfeeding research often specifies a time frame for investigation during the postpartum period. Immediate postpartum refers to the first few hours following birth where an initial breastfeeding attempt is recommended (ACOG, 2018). Early postpartum is the first few days to weeks following birth when feeding patterns and milk supply are established. Within early postpartum, lactogenesis II is the time of transition from colostrum to copious secretions of mature milk under endocrine (hormonal) control. It occurs between the third and eighth postpartum day (Neville & Morton, 2001; Wambach & Watson Genna, 2016) and is perceived by most women as a sensation of increasing breast fullness on the third to fourth postpartum day (Sriraman, 2017). Lactogenesis III, or maintenance stage with minimum milk volumes of 440

mL/day (Kent et al., 2016), lasts from approximately nine to eleven days postpartum until weaning occurs. It is maintained by autocrine control through supply and demand mechanisms (Sriraman, 2017). The general postpartum period for indicating future intentions for infant feeding are divided into milestones such as three, six, and twelve months after the birth.

Breastfeeding

General breastfeeding terminology and the description of breastfeeding methods and quantification is a current topic of debate and refinement in the research community (Cassels, n.d.; Labbok & Krasovec, 1990; Rasmussen et al., 2017; Yourkavitch & Chetwynd, 2019). In this research, breastfeeding was defined as the provision of human milk to a child. It was operationalized by maternal self-report of the method and frequency through which human milk is provided. Methods of breastfeeding addressed in the literature include feeding directly at the breast/chest, expressing by hand or pump and offering the expressed human milk by a bottle or cup, providing donor milk from a milk bank, or providing human milk offered from a peer or purchased source (Rasmussen et al., 2017).

Breastfeeding Problems

Breastfeeding problems were defined as any perceived difficulty with breastfeeding or circumstance the mother interpreted to be a problem. Some problems with breastfeeding may be detected and brought to the mother's attention by a healthcare professional, while other circumstances may appear as normal variations in feeding patterns but perceived as problems by the mother. Breastfeeding problems may have maternal or infant origins or may be from factors external to the breastfeeding dyad. Breastfeeding difficulties can stem from anatomical, physiologic, or other perceived sources varying in intensity such as pressure or lack of support from a partner and are further described below.

Anatomical Problems

Maternal breastfeeding problems may originate from breast anatomy such as flat or inverted nipples or from prior procedures causing reduced nerve innervation or scar tissue blocking ductal pathways (Wambach & Watson Genna, 2016). Infant anatomical problems can be traced to deviations in the oral cavity or digestive track that impair the mechanisms involved in latch, suck, or swallow such as palate defects or ankyloglossia (Almqvist-Tangen et al., 2012; Saffer, 2016). Feenstra et al. (2018) noted the infant's inability to latch as the primary breastfeeding challenge reported by mothers in the early postpartum period.

Physiologic Problems

Maternal physiological processes may hinder effective breastfeeding. Breast or nipple pain from excoriation or infection, engorgement, and stress hormones caused by or resulting in increased anxiety are some examples (Feenstra et al., 2018). The inability to properly position an infant at the breast is more frequently attributed to the mother due to breast size, lack of breastfeeding knowledge or experience, or general physical discomfort from a cesarean birth or perineal trauma. Infant physiologic processes impeding effective feeding could be excessive sleepiness or irritability, hypoglycemia, hyperbilirubinemia, and gestational age (Wambach & Watson Genna, 2016).

Delayed lactogenesis II (transition from colostrum to mature milk) occurs in 18.8% (Rocha et al., 2020) to as many as 57.9% (Preusting et al., 2017) of new mothers. This delay has been attributed to maternal depression, advanced age, maternal obesity, gestational diabetes mellitus, stress, and primigravid status (Matias et al., 2014; Nommsen-Rivers et al., 2010), but may also be the result of a complex feedback mechanism between mother and infant (Biancuzzo, 2003). If an ineffective latch or suck by the infant fails to trigger prolactin or oxytocin

production and circulation in the mother, a reduction in milk synthesis or release could occur (Biancuzzo, 2003).

Perceived Sources and Intensity of Breastfeeding Problems

Perceived sources of breastfeeding problems in this study were measured by self-report indicating the perceived source of breastfeeding problems encountered since the birth of the current child. Although Almqvist-Tangen et al. (2012) advocated for a more concise physiologic definition of breastfeeding problems, Feenstra et al., (2018) found self-report of breastfeeding problems to be an optimal way to account for a wide variety in maternal views of early breastfeeding challenges.

Unique to this research is operationalizing breastfeeding problems as maternal perception of the primary source of the problem(s), which could be anatomical, functional, physiologic, infant-related, or a combination of maternal and infant characteristics and interactions that resulted in breastfeeding problems. A source external to the mother or infant may include lack of knowledge about breastfeeding, social pressures, or lack of support from health professions or family. An additional component describing the origin of breastfeeding problems that was included in this research is the perceived intensity of problems.

Assistive Techniques and Devices

Assistive techniques and devices are defined as strategies to address breastfeeding problems beyond the standard of care offered to all women for basic feeding support. Assistive techniques and devices were operationalized as both a perception of the quantity of assistive devices introduced into the breastfeeding relationship as well as the recall of all devices used. Techniques were operationalized as the mother's perception of the amount of personal assistance needed and the source of that help.

The Ten Steps to Successful Breastfeeding (WHO, 2018) and the Association of Women's Health, Obstetric, and Neonatal Nurses (AWHONN) position statement on breastfeeding (2015) outline the standard of care to promote and support breastfeeding for all women. Beyond basic strategies outlined in these standards, Keemer describes "second-line interventions" (2013, p.2) as assistive techniques or devices to maintain infant nutrition through feeding difficulties and address challenges as they arise in the breastfeeding experience. Techniques and devices are used for increasing milk supply, delivering human milk or human milk substitute to an infant as a supplement, and alleviating maternal pain or discomfort. The goal of using assistive techniques and devices is to compensate for maternal or infant feeding challenges so that breastfeeding goals can be attained. Assistive techniques may include additional consultations with an International Board-Certified Lactation Consultant (IBCLC) for supervised positioning and latch assistance, pre- and post-feeding weights, and a prescribed feeding plan/schedule. Devices may include manual or electric breast pumps, supplemental nursing systems (SNS) and specialty feeding devices, nipple shells and shields, and hydrogel dressings or topical nipple treatments.

Infant Feeding Intentions

Infant feeding intentions are conceptualized as the mother's commitment to a specific nutrition source and method and operationalized as maternal self-report of the planned infant nutrition source including plans to feed either human milk or a human milk substitute. Intentions encompass the degree of motivation and the effort a person is willing to exert to perform a behavior (Dennis, 1999). They are formed during the prenatal period (Stein et al., 1987) and reevaluated upon postpartum when feedings begin.

A mother's goal for the duration of exclusive or partial provision of human milk is included in her infant feeding intentions. Forethought and planning are components of intention where necessary resources are mobilized, and navigation of obstacles and setbacks is envisioned. Beliefs about how the type of nutrition will meet the infant's needs when given by various methods, the perceived opinion of others, and the level of confidence in the ability to successfully feed the baby by a particular method contribute to a mother's decision-making process, intentions, and eventual behavior (Ajzen, 1991). To meet the nutritional needs of infants, the primary nutrition source in the first year of life must be either human milk or a substitute such as infant formula with a digestible ratio of casein and whey protein (Eidelman & Schanler , 2012).

Breastfeeding Behavior

Breastfeeding behavior moves beyond plans and intentions for infant feeding and encompasses initiation and maintenance of the behavior. In the context of this study, breastfeeding behavior included a self-report of latching and feeding at the breast, the provision of supplements in the form of expressed milk, donor human milk, or formula, and any combination of methods in the last 24-hour period.

Summary

Chapter 1 included the background, purpose and research questions, theoretical framework, and operational definitions of key concepts and variables in this dissertation research. The theoretical framework of Breastfeeding Self-Efficacy (Dennis, 1999) embedded into the TPB (Ajzen, 1991, 2002) was used to explain maternal confidence in breastfeeding when problems arise, and when a plan of interventions is introduced by health professionals to address those complications. Chapters 2 and 3 provide the review of the literature and methods. Chapter

4 and Chapter 5 are two separate manuscripts that will be submitted for publication in professional journals.

Chapter 4 is entitled “Beliefs and Decision-Making of First-Time Mothers Planning to Use a Breast Pump” and describes a descriptive, qualitative pilot study about the perceptions of breast pumps among first-time mothers. It was undertaken to provide insight about one of the many assistive-devices women use to facilitate feeding human milk. For dissemination of Chapter 4 the *Journal of Perinatal Education* is the preferred choice to reach childbirth educators. This peer-reviewed specialty journal is distributed to all members of Lamaze International. The direct implication from this descriptive study of information new mothers want to know about breast pumps includes ways to incorporate pump information into childbirth education. With a focus on advancing knowledge of current evidence among childbirth educators from a variety of disciplines, the journal promotes safe and holistic birth, postpartum, and infant care practices. The *Journal of Perinatal Education* is produced quarterly by Springer Publishing Company and has a section devoted to current and emerging trends (Springer, 2016).

Chapter Five entitled “Breastfeeding Self-Efficacy, Source of Problems, and Techniques and Devices to Facilitate Breastfeeding in Early Postpartum” is the report of a longitudinal, correlation study of the experiences of breastfeeding mothers in the early postpartum period using interventions to address breastfeeding problems. The manuscript is presented in traditional form for a research report including introduction, background, methods, results, discussion, and implications for practice. The manuscript presented in Chapter Five will be submitted to the *Journal of Obstetric, Gynecologic, and Neonatal Nursing* (*JOGNN*) for consideration. The *JOGNN* is the official research journal of the over 25,000-member Association of Women’s Health, Obstetric, and Neonatal Nurses (AWHONN; 2019) and is the first choice for publication

of results from this study. With an impact factor of 1.473 in 2017 and a 5-year impact factor of 1.812, *JOGNN* abstracts are currently found in numerous databases including CINAHL, Medline, and PsycINFO (JOGNN, 2019).

CHAPTER 2: REVIEW OF THE LITERATURE

The purpose of this research is to investigate how a mother's perception of problems in the early postpartum breastfeeding experience and the techniques and devices to address those problems influence maternal BSE, feeding intentions, and breastfeeding behavior in a sample of mothers providing human milk to healthy, term newborns. Consistent with the aims of this study, the review of the literature is as follows: (a) literature describing the origin of breastfeeding problems; (b) studies addressing the TPB and BSE; and (c) literature about assistive techniques and devices to overcome breastfeeding problems. Chapter 2 also highlights gaps and research opportunities as well as potential research challenges. One of these challenges was collection of data during the COVID-19 pandemic. Literature contributing to the creation of researcher-designed survey question to screen for stress, anxiety, and depression related to COVID-19 is included in Chapter 2.

Origin of Breastfeeding Problems

Complications with breastfeeding may originate with the mother and include flat or inverted nipples, pain, and actual or perceived low milk supply (Wagner et al., 2013). Infant factors may include poor arousal to feed, inadequate latch indicated by consistent scores of less than 7 on the standardized LATCH assessment when assessed by nurses in the hospital setting (Jensen et al., 1994) or by excessive weight loss from poor intake. Wagner et al. (2013), in their mixed method study of 532 primiparas in the U.S. found that a problem with infant feeding by the third postpartum day was noted by 92% of women. Breast pain was reported by 44% of first-time mothers with 40% recounting concerns about milk supply. Although the participants were followed for 60 days postpartum, most concerns were expressed in the first 14 days. In a study of 1,437 Danish women, as many as 40% of new mothers reported breastfeeding problems in the

early postpartum period. The most reported problems were difficulty latching and wounded nipples (Feenstra et al., 2018). Of greatest concern is early weaning in women experiencing breastfeeding difficulties. Of the 27% of women reporting breastfeeding problems in the first postpartum month in a Swedish sample of 2,666 women, one-third attributed cessation of breastfeeding directly to breastfeeding problems (Almqvist-Tangen et al., 2012). Perceived or actual low milk supply is frequently cited as the most common problem in the early postpartum period expressed by mothers (Kent et al., 2016).

In a large cohort study in Canada (N = 2954), 62% of women who initiated breastfeeding reported more than one feeding problem in the categories of problems "with baby" such as latching, "personal discomforts with breastfeeding" including nipple or breast pain, and "other difficulties" (p. 5) such as perceived low milk supply or flat or inverted nipples (Hobbs et al., 2016). Women putting their newborn to breast within 30 minutes after birth in this study had feedings with higher LATCH scores and subsequently expressed higher breastfeeding self-efficacy.

In addition to LATCH scores, tracking infant weight loss and the rate of regaining birth weight is another method for health professionals to determine the need for feeding interventions (Kent et al., 2015). Citing World Health Organization (WHO) infant growth data, Powers (2016) reported that although most breastfed infants will have regained their birthweight by the seventh postpartum day, up to 25% will not have achieved this milestone in the first week. This delayed weight gain indicates ineffective milk removal and transfer to meet nutritional needs.

Studies of Breastfeeding Self-Efficacy

When applying the TPB to decision-making about breastfeeding, beliefs and intentions are formed in the prenatal period and then actualized in the early postpartum as infant feedings

begin. Self-efficacy is a central contributor to intentions to provide human milk for infant nutrition. Prenatal beliefs and intention for mother's milk to provide the full complement of nutrition with an easy transition into effective breastfeeding may be superseded by feeding difficulty or health challenges for the newborn or medical complications with the mother. Feeding challenges or health obstacles in early postpartum cause alterations in the level of control over breastfeeding patterns and behavior and can directly impact maternal self-efficacy in the context of breastfeeding (Dennis, 1999; 2003).

Tuthill et al. (2016) reviewed the literature to find available instruments to measure self-efficacy related to infant feeding and noted the use of six instruments. The BSES-SF (Dennis, 2003) was identified as the most appropriate to administer to breastfeeding mothers in the early postpartum period because others were primarily designed for prenatal administration or in mothers perceiving low milk supply. The authors cautioned that inaccurate and nonrepresentative results could occur from improper selection of one of the six instruments identified in their search. Two scales identified by Tuthill et al. (2016) were designed for prenatal use and another had a greater focus on perceived milk insufficiency. Assessing maternal mental health and coping with breastfeeding challenges in the immediate postpartum period through standardized measures was found by the authors to be uncommon in practice. The BSES-SF (Dennis, 2003) is a 14-item Likert scale written on a seventh to eighth grade reading level that takes less than 5 minutes for self-administration. The BSES-SF has a Cronbach's alpha of 0.94. The scale has construct validity as well as predictive validity for exclusive breastfeeding between 1 week postpartum and at both 4 and 8 weeks postpartum (Dennis, 2003; Dennis & Faux, 1999). It is the most widely used scale found in the research literature to measure BSE diverse samples in the U.S. and has been translated into multiple languages.

Experience with breastfeeding is a mediating factor supported by BSE theory (Dennis, 1999) with higher initial self-efficacy noted in multiparous women (Gerçek et al., 2016; Glassman et al., 2014; Hinic, 2016; Shiraishi et al., 2020; Yang et al., 2016). Other demographic factors such as race and ethnicity, income level, and maternal age influence maternal confidence in breastfeeding (Hinic, 2016). Alghamdi et al. (2017) found that after controlling for age, parity, marital status, and employment in a low-income sample of women, Hispanic women had the highest breastfeeding rates yet the lowest levels of BSE and knowledge about breastfeeding when compared to Black and non-Hispanic White women. Glassman et al. (2014) found BSE to be the sole modifiable factor in improving breastfeeding rates in a primarily Dominican low-income sample of women in the U.S. In a Danish study of equal percentages of primiparous and multiparous participants, Feenstra et al. (2018) measured BSE by one investigator-developed question on a survey. Mothers with low BSE were 2.67 times 95% CI [1.99, 3.59] more likely to report early breastfeeding problems with a potential for reduced duration and exclusivity of providing human milk. Among various belief patterns pivotal in the TPB, BSE as a component of perceived behavioral control has a strong influence on the degree of intention and on actual breastfeeding behavior, especially for primiparas, various ethnic groups, and in women experiencing breastfeeding problems.

Assistive Techniques and Devices

Activities such as immediate and frequent maternal and newborn skin to skin contact and early initiation of breastfeeding are designed to protect, promote, and support the breastfeeding relationship beginning during the inpatient postpartum experience (Hill & Aldag, 2005). The standard of care in the vulnerable period of establishing breastfeeding prior to hospital discharge recommended by the Academy of Breastfeeding Medicine (ABM) is for a nurse trained in

breastfeeding management or a lactation specialist to observe and document lactation effectiveness every 8-12 hours (Evans et al., 2014). The Ten Steps to Successful Breastfeeding are evidence-based measures encouraged in healthcare facilities providing services for newborns. The Ten Steps are iterated in the Baby Friendly Hospital Initiative (BFHI) instituted by the World Health Organization (WHO; 2017) and UNICEF. In a group of 114 primiparous women, Aghdas et al. (2014) found that skin-to-skin care resulted in higher BSE scores and a successful breastfeeding initiation rate of 56.6% compared to 35.6% in the comparison group without intentional skin-to-skin ($p = 0.02$).

Interventions beyond the standard care described in the BFHI Ten Steps to Successful Breastfeeding (WHO, 2017) are instituted when maternal or newborn breastfeeding complications arise. Maternal, infant, or combined factors may be the impetus for a health professional to initiate a feeding plan of varying complexity consisting of various technological and assistive interventions (Chantry et al., 2014; Hanna et al., 2013). The achievement of successful breastfeeding in the first week of life is critical to continued milk production, as milk volumes produced by days four to six postpartum in lactogenesis II are positively correlated with milk supply at 6 weeks postpartum (Hill & Aldag, 2005).

Formula Supplementation

The primary goal of policy and practitioner recommendations is for infants to receive the full complement of species-specific, nutritional and bioactive compounds from human milk for optimal growth and development (Kim & Froh, 2012). However, the percentage of infants receiving formula supplementation in the first two days of life has risen from 2015 to 2017 (from 17.2% to 19.2% nationally and 15.6% to 18.4% in North Carolina), moving steadily away from the Healthy People 2020 national goal of 14.2% (Office of Disease Prevention and Health

Promotion, 2018, 2020). Using formula to supplement infant nutrition, often for actual or perceived low milk supply, infant weight loss, or repeated poor latch and milk transfer at the breast, is a common intervention. In a racially diverse sample of 448 new mothers in the U.S., Chantry et al. (2014) found a higher rate of non-exclusive breastfeeding at 30 days when formula supplementation occurred in the hospital among women who intended to exclusively breastfeed and a three-fold increase in breastfeeding cessation by 60 days. These rates were adjusted for the original strength of intention to exclusively breastfeed. In another study of 1,107 mother-baby couplets in the U.S., maternal concerns about milk supply at 2 weeks postpartum led to decreased breastfeeding at six months (Flaherman, Beiler, Cabana et al., 2016).

Breast Pumps

A mother's own colostrum or mature milk can be conferred to the infant directly at the breast, or pumped and given with a bottle, cup, or specialty feeding device. The Affordable Care Act increased the availability of low to no cost breast pumps as well as lactation consulting services to help women navigate breastfeeding challenges (Centers for Medicare and Medicaid Services, 2018). Primiparous mothers have been found to be more likely than women with subsequent children to initiate use of a breast pump during postpartum hospitalization or within the few days following birth (Loewenberg Weisband et al., 2017). Loewenberg Weisband et al. reported that women in their study cited difficulty latching and enhancing milk supply as reasons for early pump use. Additionally, in a U.S. inner-city sample (N = 355) of primarily African American mothers (95.4%) not differentiated by parity, Bream et al. (2017) found rates of any breastfeeding at 1.5 to 3.5 months to be higher for women without a breast pump than those with a pump (46.9% vs. 31.4%, p = 0.004).

A secondary analysis of cohort data from the Infant Feeding Practices II study of 1,116 women expressing human milk between 1.5 to 4.5 months postpartum found nonelective breast pump use, defined as not originally intending to use a pump but doing so for a specific need, contributed to a shorter duration of human milk feeding (HR: 1.12; 95% CI: 1.05, 1.21) and decreased exclusive breastfeeding (HR: 1.14; 95% CI: 1.09, 1.20) (Felice et al., 2016). Complications leading to nonelective use of a breast pump in this study included nipple pain when the baby was at the breast, the need to increase or maintain a milk supply, and to relieve engorgement. Of the women using a pump for any reason, 41.8% reported concerns about low milk supply compared to 18.3% of women in the study who did not use a breast pump (Felice et al, 2016).

Additional Devices

Interventions to address breastfeeding challenges often incorporate devices such as breast pumps, supplemental nursing systems, formula or donor milk supplementation by bottle, cup, or dropper, and various aids for sore or flat/inverted nipples such as nipple shields (Feenstra et al, 2018; Keemer, 2013). The literature is conflicting about women's views and reliance on devices to assist with breastfeeding as helpful or detrimental, and the impact of devices on BSE is rarely investigated. In a study of 4,815 Danish primiparous and multiparous mothers, Kronborg et al. (2017) found that 22% of participants initially used a nipple shield to address a breastfeeding problem and 7% continued to use the shield for the duration of the breastfeeding experience. In this study, results were mixed on whether the use of a nipple shield was helpful or caused dependence on the device to achieve feeding goals, and the use of a shield led to greater than a three-fold risk of early cessation in both primiparas and multiparas. In a large, prospective cohort study of primiparous women in Australia, nipple shield use and milk expression with a breast

pump led to a greater risk of developing mastitis (Cullinane et al., 2015). Flaherman et al. (2012) did not find a difference in breastfeeding confidence between women who used a pump or hand expression, however Keemer (2013) found significantly lower scores on the BSES-SF in women who used any interventions described as a "second-line strategy" (p. 2) to manage breastfeeding problems. The type and frequency of use of each second-line strategy was quantified, as was origin of feeding complication, but individual and cumulative correlations between strategy and breastfeeding self-efficacy were not reported.

Gaps Identified in the Research Literature

One noted gap in the research literature is an apparent lack of studies comparing breastfeeding self-efficacy based on maternal, infant, or combined origin of breastfeeding complications. Additionally, no studies were found that document alterations in breastfeeding self-efficacy when several interventions at a time are utilized to achieve successful breastfeeding. Felice et al. (2016) explored cumulative reasons for nonelective pumping and cumulative effects of treatment on infant feeding patterns. The authors found that greater pumping frequencies corresponded with a higher likelihood of cessation of human milk feeding and an increased number of nonelective reasons for pumping, resulting in shorter durations of exclusive human milk feeding and any human milk feeding. However, breastfeeding self-efficacy was not examined in this study

The immediate postpartum period from birth to 1-2 weeks postpartum is a time of rapid transition when breastfeeding problems often occur and infant feeding assessment, support, and intervention by nursing and lactation professionals is most common. However, the U.S. Preventive Services Task Force notes that even well-intentioned breastfeeding interventions pose a risk for adverse events and research is needed to examine these events (Flaherman & Von

Kohorn, 2016). Although some interventions aide in the achievement of breastfeeding goals, others perpetuate anxiety about milk supply and induce frustration when multiple health professionals offer competing counsel (Flaherman, Hicks, Huynh, et al., 2016). Emotional support and reinforcement of knowledge and skills associated with successful breastfeeding by a health professional such as a nurse, midwife, or IBCLC was found to be particularly helpful to enhance the breastfeeding self-efficacy in a sample of adolescent women in Canada (Dennis et al., 2011). However, the detrimental effect of lack of support from health professionals and inconsistent guidance was reported in quantitative findings and reiterated in personal interviews with new mothers in a mixed methods Danish study (Feenstra et al., 2018). Research is needed addressing the introduction of interventions to address breastfeeding problems by health professionals in the U.S.

Addressing Gaps in Research

Health professionals serving first-time breastfeeding mothers will benefit from this study by having an increased awareness of the knowledge and beliefs about the influence of the source of breastfeeding complications on maternal breastfeeding self-efficacy as well as the impact of the number and nature of interventions on evolving self-efficacy and feeding patterns over the first few postpartum weeks. This awareness will guide prenatal and early postpartum patient education about breastfeeding challenges. It will also inform patient advocacy during the development of nursing plans of care for maternal-newborn feeding dyads needing intervention(s) to address feeding challenges.

Routine evaluation and documentation of breastfeeding self-efficacy during the inpatient postpartum hospitalization or during follow up care is not noted in the literature or in personal practice as a nurse and IBCLC. Staff training about assessing for and addressing low

breastfeeding self-efficacy in the postpartum period is also absent in the literature. A benefit of this study is exploring the need for assessment of breastfeeding self-efficacy in all women versus targeting assessments for at-risk groups in the early postpartum period.

Interventions to increase maternal confidence in breastfeeding skills based on BSE screening can incur potential costs, time, and staffing increases for development and administration. Alghamdi et al. (2017) recommends tailoring interventions and programs to address breastfeeding disparities among racially and socioeconomically marginalized groups to maximize resources. To tailor programs addressing breastfeeding self-efficacy, evidence about the origin of complications and the influence of treatment plans on breastfeeding self-efficacy is needed. The development and implementation of self-efficacy interventions is a promising area for future translational research and feasibility studies for nurses. Mode of administration of screening and interventions, staff training needs, costs, and impact on breastfeeding self-efficacy and feeding duration and exclusivity are all variables to consider.

Yang et al. (2016) had a novel finding in a sample of primarily primiparous Chinese women. In their study, coping with breastfeeding challenges in a similar way as other challenges in life was one of the three highest scoring items on the BSES-SF Chinese translation. This indicates that coping through feeding adversity may actually bolster self-efficacy if coping strategies are effective. More research is needed with samples in the U.S. to determine if these findings are replicated in women facing maternal or infant feeding obstacles.

Research Challenges

A limitation in generalizing the results of breastfeeding research to the population of childbearing women in the U.S. is the homogeneity of samples in much of the current literature. Except for some international samples or studies that recruited a target demographic, samples

reported in the literature tended to be primarily White and well-educated (Hinic, 2016; Hobbs et al., 2016; Keemer, 2013; Pollard & Guill, 2009). Awareness of low breastfeeding self-efficacy, especially in demographic groups with health and healthcare disparities and those with historically lower rates of breastfeeding initiation and duration can help nurses individualize support interventions not only to increase overall breastfeeding self-efficacy but to provide targeted support during complications. To address the challenge of diverse demographic representation, a sampling plan corresponding to the demographic complexity of the population of women of childbearing age in the study area was incorporated into the research protocol of this study.

Demonstrating the clinical ease of use of the BSES-SF in assessing situations where maternal confidence can be supported by healthcare professionals can lead to incorporation of the tool into standard patient care during the immediate postpartum hospitalization and follow up appointments. Breastfeeding self-efficacy is a modifiable factor and is predictive of breastfeeding duration (Dennis, 2003). Research correlating breastfeeding self-efficacy and the origin of breastfeeding complications as well as interventions to treat those complications will provide evidence to support routine self-efficacy assessment of this population. Nurses can then direct targeted resources for emotional support of women with low BSE.

COVID-19 Pandemic

The WHO declared the novel coronavirus SARS-CoV-2 (COVID-19) a pandemic on March 11, 2020, followed quickly by a National Emergency declaration in the U.S. (CDC, 2020c). As of May 22, 2020, just prior to the launch of the study, 1.5 million of the over 5 million worldwide cases of COVID-19 had occurred in the U.S. (WHO, 2020), and over 900 deaths had been attributed to COVID-19 in North Carolina (North Carolina Department of

Health & Human Services [NCDHHS], 2020). In addition to widespread fear of severe illness and death from COVID-19, stay-at-home orders enacted to slow the exposure and spread of the virus were impacting social determinants of health. For example, the unemployment rate of 14.7% in late April, representing 23.1 million people from all racial and labor force categories, was the highest since U.S. Bureau of Labor Statistics recording began in 1948 (U.S. Department of Labor, 2020). Economic conditions led to anxiety about potential food and basic household supply deficiencies. Access to education, community-based resources, recreation, and social support were altered or reduced amid stay-at-home orders and quarantine processes (U.S. Department of Health and Human Services [USDHHS], 2020).

Similar patterns of economic instability, reduced access to environmental and social services, and constraints on support networks are seen during natural and other disasters and may uniquely impact the physical and mental health of pregnant and postpartum women. In a systematic review of 49 international studies of the effects of disasters on perinatal health, severity of exposure was listed as the strongest predictor of maternal mental health disorders (Harville et al., 2010). Increased rates of mental health disorders such as Posttraumatic Stress Disorder (PTSD) and depression in the perinatal period have been noted following the World Trade Center attack (Engel et al., 2005), earthquakes (Ren et al., 2014), and floods (Brock et al., 2015; Harville et al., 2009; Kildea et al., 2018). Although Harville et al. (2009) found rates of PTSD and depression in pregnant and postpartum women similar to the increase in the general population following flooding from Hurricane Katrina, a negative effect on health behaviors such as decreased breastfeeding exclusivity and longevity was noted.

Although little is known about the long-term psychological impact from sustained societal disruption from the current COVID-19 health crisis, reported stress and anxiety levels

were higher during the early months of the pandemic than annual ratings in the U.S., particularly for families with children (American Psychological Association, 2020). Quarantine mandates have also altered social support structures for pregnant women and new families. Akan (2012) found in their study of 177 pregnant and postpartum women that under nonturbulent societal conditions an inverse relationship existed between social support and anxiety. In a sample of 255 postpartum Canadian women, an 11% reduction (aOR = 0.89; 95% CI, 0.80-0.99) in breastfeeding at six months was noted for a single point increase in anxiety scores at three months (Adedinsewo et al., 2014). Similar elevated perceived stress levels correlated with decreases in breastfeeding interest and commitment in a sample of 788 Turkish mothers in the first six months following birth (Duran et al., 2019).

To explore the impact of COVID-19 in this study participants were screened for extreme levels of stress, anxiety, or depression attributed to the pandemic that could influence study results. Eight researcher-designed questions were added to both the initial and follow up survey prior to data collection.

Summary

Chapter two presents a review of the literature about the origin of breastfeeding problems in early postpartum, breastfeeding self-efficacy, and the use of popular assistive devices such as breast pumps to facilitate the provision of human milk to newborns. Gaps in research are discussed relevant to the few studies found that addressed whether a maternal or infant origin of breastfeeding difficulty has a greater impact on breastfeeding self-efficacy. Additionally, support is offered for the need to investigate cumulative interventions to address challenges and resultant breastfeeding self-efficacy.

CHAPTER 3: METHODS

The purpose of this study was to investigate how a mother's perception of problems in the early postpartum breastfeeding experience and the techniques and devices to address those problems influenced maternal breastfeeding self-efficacy (BSE), feeding intentions, and breastfeeding behavior in a sample of mothers providing human milk to healthy, term newborns. The initial phase (Phase One) involved qualitative research for the purpose of exploring beliefs and decision-making processes associated with breast pump use in first-time mothers providing full or partial human milk feedings to healthy, term newborns at 24-72 hours after birth. The primary phase (Phase Two) consisted of quantitative correlational research to investigate BSE in the early postpartum period. Chapter three describes the methodology for each phase, including the study design, setting, sample and sampling process, protection of human subjects, instruments, data collection procedures, and data analysis procedures. A discussion of limitations and concluding summary is presented.

The research questions were:

1. What is the relationship between a mother's perception of the origin of breastfeeding problems and BSE?
    a. What is the relationship between maternal perception of the *source* of breastfeeding problems and BSE?
    b. To what extent does a mother's perception of the *intensity* of breastfeeding problems influence BSE?
2. To what extent do the techniques and devices to address breastfeeding problems influence BSE?

a. What is the relationship between a mother's perception of *personal assistance* needed to overcome breastfeeding problems and BSE?
b. Does a mother's perception of the *quantity of assistive techniques and devices* introduced to treat breastfeeding problems influence her BSE?

3. Does the relationship among perceived intensity of breastfeeding problems, intensity of personal assistance, and quantity of assistive techniques and devices to address breastfeeding problems influence BSE?
4. Does the relationship among perceived intensity of breastfeeding problems, intensity of personal assistance, and quantity of assistive techniques and devices to address breastfeeding problems influence a mother's current breastfeeding behavior and future infant feeding intentions?

Study Design

Phase One

A qualitative descriptive design with a single face-to-face interview with each participant was used for the initial phase of this study. Qualitative research methods are founded on naturalistic inquiry to explore motivations, concerns, responses, and reasoning without experimental manipulation of variables (Sandelowski, 2000). It is an appropriate methodology when seeking to understand the context of social issues and the meaning individuals ascribe to experiences (Creswell & Creswell, 2018). Presented and later refined by Sandelowski (2000, 2010), qualitative description often uses purposive sampling and content analysis underpinned with a theoretical framework, to give a descriptive summary from the words and events in the data (Bradshaw et al., 2017). The theory of planned behavior (TPB; Ajzen, 1991, 2002) informed the interview guide and content analysis. The goal was to present a description of the research

phenomenon in an order and way that can be validated and easily understood by others for clinical application. (Colorafi & Evans, 2016; Sandelowski, 2000).

Phase Two

A longitudinal, correlational survey design was used to explore non-modified variables of perceived source and intensity of breastfeeding problems, quantity of devices and assistive techniques including help from others to overcome breastfeeding problems, BSE, current breastfeeding behavior, and future infant feeding intentions during the early postpartum period. Data were collected twice in the early postpartum period through online surveys administered two weeks apart. The study examined the strength of relationships between perceived source and intensity of breastfeeding problems and the perceived quantity of assistance and devices in relation to BSE. Additionally, groupings of the perception of intensity of problems, assistance needed, and techniques/devices used were measured against the variables of BSE, future infant feeding intentions, and current breastfeeding behavior. Creswell and Creswell (2018) support a correlational survey design for research questions about relationships between variables as well as associations between variables over time through longitudinal data collection.

In this study, the TPB and BSE theory (Dennis, 1999) were used as theoretical frameworks to determine investigation points and design research questions. In the context of lactation and infant feeding as illustrated by the TPB, having confidence in the skills of breastfeeding to successfully achieve goals for duration and level of exclusivity of providing human milk may be influenced by the amount of actual behavioral control a mother has over feeding in the early postpartum period. This study incorporated concepts from the TPB by measuring confidence in breastfeeding skills through the Breastfeeding Self-Efficacy Scale – Short Form (BSES-SF) along with future intentions and current breastfeeding behavior. Actual

behavioral control was explored by measuring the source and intensity of breastfeeding problems and elements of the plan of care to address those problems.

Setting

The study was conducted at facilities offering perinatal and lactation support services in the Cone Health System in central North Carolina. Phase One occurred at a community hospital in the system, while Phase Two was expanded to include the system's larger Level 3 women's hospital. The larger hospital has Baby-Friendly Hospital Initiative (Baby-Friendly USA, 2021) designation, and the community hospital is in the process of attaining designation indicating the Ten Steps to Successful Breastfeeding are implemented as the standard of care to promote and support breastfeeding (WHO, 2018). An International Board-Certified Lactation Consultant (IBCLC) is present on the postpartum units daily to offer expert guidance on infant feeding in addition to the care provided by Registered Nurses (RNs). The average length of stay for women after a vaginal birth in these settings is 24-48 hours and 48-72-hours for women who had a cesarean birth.

When women leave the hospital setting, follow-up care is scheduled with a pediatrician and obstetrician or midwife. The hospitals are located in neighboring counties, each with a public health department where the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) offers lactation counseling, breastfeeding peer counselor services, and nutritionists for women who qualify based on financial need. Outpatient IBCLC consultations are available at each hospital in person or by phone and were extended to include telehealth visits during the coronavirus pandemic.

Sample

The Perinatal Quality Collaborative of North Carolina (PQCNC, 2013) reports approximately 6,000 births occur annually at the Cone Health Women's and Children's Center. Cone Health Alamance Regional, a community hospital within the Cone Health system, located in a neighboring county averages 1,200 to 1,400 births each year. Breastfeeding initiation rates in both hospitals are above 80%.

Phase One

Eight participants were recruited over a one-month period in the spring of 2019. Purposive sampling was used to select a sample with demographics resembling the local population of childbearing women. For inclusion in the study a participant had to be a first-time mother with an infant between 24 and 72 hours old, age 18 or older, English-speaking, and indicated a feeding choice of either breastfeeding or a combination of breast and formula feeding upon hospital admission. Mothers exclusively formula feeding or with an infant in the neonatal intensive care unit (NICU) were excluded from the study. Sample size was determined by factors associated with obtaining information power including using an established theoretical framework and having a narrow aim where the targeted population could offer rich experiential data through high quality interviews (Malterud et al., 2016).

Phase Two

Consecutive sampling (Polit & Beck, 2017) was used to recruit mothers meeting inclusion criteria over a 5-month period from July until November 2020 from an accessible population of women from the two hospitals offering obstetrical services in the Cone Health system during postpartum hospitalization. Consecutive sampling is superior to convenience sampling in reducing bias because all members of the accessible population have an opportunity

to participate (Polit & Beck, 2017). Inclusion of all hospitals offering perinatal and lactation services in the Cone Health network maximized recruitment opportunities within the study timeframe. Participants were eligible for inclusion if their primary language was English, they were greater than 18 years old, were primiparous or multiparous following a vaginal or cesarean birth, were feeding any human milk, and had birthed a healthy singleton infant greater than 37 weeks gestation. Exclusion criteria were primary language other than English, less than 18 years old, indicated upon hospital admission the intention to exclusively formula feed, maternal health complications or unexpected surgery following birth, or infant transfer to a specialty care nursery unit.

In this study, a representative sample was sought that approximated the demographic characteristics of the population of English-speaking women of childbearing age in North Carolina and surrounding states in the southeast. In the U.S., 84.1% of women initiate breastfeeding, while 80.3% of women in North Carolina, 80.5% in South Carolina, and 91.7% in Virginia begin their infant feeding experience with the provision of human milk (CDC, 2020a). Similar to other states in the region, formula supplementation in the first two days of life is experienced by 18.4% of infants in North Carolina (CDC, 2020a). The average racial and ethnic composition of the study area in the Triad region closely resembled the state averages in 2019, respectively, with 56.6% and 62.8% non-Hispanic White, 27.8% and 22.2% non-Hispanic African American, 3.6% and 3.2% Asian, and 10.5% and 9.6% Hispanic. A language other than English is spoken at home by 12.8% of people in the study area and 11.6% in North Carolina (U.S. Census Bureau, 2019).

A power analysis strengthens the statistical conclusions drawn from the study and increases the probability of distinguishing actual relationships, thus decreasing the probability of

a Type II error. For a sample with 11 predictor variables including those gathered by demographic questions, power of 0.80, significance (α) set at .05, and average population correlation (effect size) of 0.20, a sample size of 124 participants was necessary (Polit & Beck, 2017). A target of approximately 250 women meeting eligibility criteria to receive information about the study was set to account for up to a 50% declination and attrition rate at the second (two-week postpartum) data collection point. At the conclusion of the data collection period, approximately 600 women meeting eligibility criteria had been given a flyer with information about the study. By December 31, 2020, 125 participants had initiated the first survey with 118 completing all questions. The second survey was initiated by 102 participants with 100 respondents completing all questions, resulting in a total of 97 complete data sets from the initial and 2-week follow up surveys.

Human Subjects Protection

The University and Medical Center Institutional Review Board (UMCIRB) approved Phase One and Phase Two of the study (Appendix A) as expedited due to no more than minimal risk to participants. Additionally, research activities were vetted through the Nursing Research Council (NRC) of the Cone Health System and an authorization agreement with the UMCIRB for each phase was approved by the Institutional Review Board for the Cone Health System (Appendix B). The Principal Investigator (PI) was assigned a research navigator by the NRC. The role of the navigator was to be a resource throughout the research process, serve as a liaison between the PI and the unit, and assist in the Cone Health IRB process.

Phase One

An IBCLC or charge nurse identified women meeting eligibility criteria and inquired about interest in speaking with the PI about participation in an interview for a research study.

The PI did not access medical records of participants. All women approached about the study agreed to participate in one face-to-face interview for approximately 45 minutes while they were an inpatient on the postpartum unit. After the PI read a short script detailing the purpose of the study, each participant reviewed and signed the informed consent document (Appendix C) and was given a copy before the interview and recording began. To ensure anonymity, each participant and corresponding interview transcript was assigned a number for recordkeeping, and participants were given the option to select a pseudonym to be used during the interview. All identifiers in data files were removed except the assigned number during analysis. For confidentiality, the audio-taped interviews were transcribed by the principal investigator into data files in NVivo version 12 software to be kept for 6 years on a secure, password-protected East Carolina University (ECU) research Piratedrive online location. All paper files will be kept in a locked box or locked filing cabinet in the locked research office at the ECU College of Nursing for a period of 6 years.

Participants were notified in the introductory script and consent form that they could decline to answer any questions and withdraw from the interview at any time for any reason without negative consequences. A copy of the interview transcript was offered but no participant accepted this offer. The nature and quality of the questions were not anticipated to induce anxiety or stress in participants, but the inpatient setting for completion of the pre-interview questionnaire allowed for ready availability of nursing, lactation, and medical staff for any unforeseen physical or psychological consequences. A $10 grocery store gift card was given to each participant at the conclusion of the interview for compensation for their time. Participants in the study may not have experienced other direct benefits from involvement in the study, although having an opportunity to reflect on their beliefs and knowledge of breast pumps may have

stimulated questions to ask the hospital staff prior to discharge home about safe and effective breast pump use.

Phase Two

All changes to the study after initial IRB approval were submitted to the UMCIRB for review and approval. Changes included: revisions to the study team membership of replacing a faculty committee member no longer employed in the College of Nursing and replacing her with another faculty committee member, addition of researcher-developed questions to screen for postpartum distress related to the COVID-19 pandemic, and an amended study time frame to extend the data collection period to December 2020 due to delays caused by the pandemic. There were no unanticipated events increasing risk to participants or others during the study. All study team members provided evidence of recent training in the protection of human research participants.

Participation in this study was voluntary, and the purpose of the study was clearly described in the recruitment flyer and in an informed consent page displayed once eligible participants logged in to the online survey site. The recruitment script and informed consent document notified all potential participants that electing not to participate would have no detrimental effect on their nursing or medical care. Participants had the option to end the questionnaire prematurely or to omit questions. Anonymity was maintained by assigning each participant response set a numeric identifier in the database. Online survey data were collected in Research Electronic Data Capture (REDCap) which is Health Insurance Portability and Accountability Act (HIPAA) compliant for confidentiality (Harris et al., 2009). To further ensure confidentiality, the only personal health identifier (PHI) collected from participants and stored

exclusively in REDCap was an email address used to generate a reminder with link to a follow up survey and to notify winners of a gift card drawing.

For anonymity, only the assigned participant number was downloaded into International Business Machines Statistical Package for the Social Sciences (IBM SPSS) version 26 software as an identifier along with survey answers. Downloaded materials were kept on devices secure and in compliance with ECU computing standards. Persons listed in the IRB application had access to the online data in REDCap, but only the PI had export rights. Data files related to the study will be kept for six years on a secure, password-protected ECU research Piratedrive online location. No paper files containing confidential participant information were generated and in need of secure storage through the course of this study.

There was no cost to participate in the research study. Coercion was minimized by informing potential participants that the survey was voluntary and could be completed at their leisure. A magnet frame was offered to the first 150 potential participants, and a drawing was held for five $25 Visa gift cards as incentives. Email addresses used to notify incentive winners were deleted following the prize drawing. Participants in the study may not have benefitted directly from involvement in the study, although having an opportunity to reflect on any breastfeeding challenges could have stimulated questions or recognition of the need for lactation support.

The nature and quality of the questions were not anticipated to induce anxiety or stress in participants, but the inpatient setting for completion of the first questionnaire allowed for ready availability of nursing, lactation, and medical staff for any unforeseen consequences. Contact information for the lactation office at each hospital was listed as a resource in reference material for the study. Participants were directed to contact their obstetrician or midwife for personal

concerns or their pediatrician for infant health and feeding concerns. A hotline phone number for those experiencing stress, anxiety, depression, and suicidal ideation was listed at the top of the survey for distress related to COVID-19.

Instruments

Phase One

The demographic questions including maternal age, marital status, race/ethnicity, level of education, insurance provision status, birth type, gestational age and hours since birth of the newborn, infant gender and birth weight, and use of educational and support services for new families were administered in the pre-interview survey. A researcher-developed interview guide available in Table 2 of Chapter 4 was reviewed by a panel of International Board-Certified Lactation Consultants (IBCLCs). The guide consisted of general opening questions such as "Tell me about your plans for feeding your baby" and "Have any of your plans for feeding or using a pump changed since you have had your baby?" Constructs in the TPB (Ajzen, 1991) were considered in the formation of questions investigating attitudes about breast pumps such as the process for learning about the types of pumps and their functionality. Participants were asked about the beliefs of influential others and about control beliefs concerning processes that would lead to success in using a breast pump and about anticipated obstacles for breast pump use. To address intention and behavior in the theory, participants were asked to reflect back through the pregnancy and initial time after birth to note the process for deciding if and when to use a breast pump and how one had or would be obtained. Additional questions asked about views of the place of breast pumps in society at the present time.

Phase Two

The survey instruments for this study were a 33-item researcher-developed tool including demographic questions and a series of questions addressing the study variables (Appendix E), eight optional items addressing the effect of the COVID-19 pandemic on the experiences of pregnancy and breastfeeding, and the 14-item standardized BSES-SF (Appendix G). The surveys were accessed and completed online via HIPAA-compliant REDCap software.

Survey instruments used in this study were completed in approximately 15 minutes. They were appropriate for participants to complete about their initial breastfeeding challenges and perceptions during the time of predominant colostrum production from 1-3 days postpartum. The follow-up survey accessed via a link in an email mirrored the initial survey with the exclusion of demographic questions. Collecting data 2-3 weeks into the breastfeeding experience enabled the researcher to receive feedback about any new patterns of breastfeeding behavior and feeding intentions during the time of transition from colostrum to mature milk.

The original Breastfeeding Self-Efficacy Scale (BSES) was written at a seventh to eighth grade reading level (Dennis & Faux, 1999) and some words were added or deleted to further enhance clarity in the BSES-SF (Dennis, 2003). The BSES-SF combined with researcher-designed items for the current study yielded a research tool with an 8th-grade reading level on the Flesch-Kincaid scale (WebFX, 2019).

Researcher-Designed Questionnaire

Researcher-designed survey questions included two inclusion criteria verification questions, nine participant demographic questions, three items about breastfeeding problems, four items about assistive techniques and devices, seven items addressing current breastfeeding

behavior and future feeding intentions, and eight items about experiences of pregnancy and breastfeeding during the COVID-19 pandemic (Appendix E).

Inclusion criteria of having a term newborn was verified initially. Within this question, gestational age at birth was subdivided into two week increments from 37 to 42 weeks or beyond for demographic purposes. All participants also verified that their newborn had not been admitted to a neonatal intensive care unit. If responses indicated the participant did not meet inclusion criteria, the survey was terminated, and the participant was thanked for their time and interest.

Demographic information collected from the participants included amount of breastfeeding experience, type of birth, maternal age, educational status, race/ethnicity, and insurance source. Asking about breastfeeding experience differentiated between primiparous and multiparous new mothers. This question was superior to asking about birth order because it should not be assumed that multiparous women have experience with breastfeeding. Differentiating between vaginal and cesarean birth, older versus younger mothers, and low and high educational status aligns this study with demographic data collected in many other breastfeeding studies in the literature. Race and ethnicity data were collected to evaluate whether the sample reflected the population in the region and U.S. Finally, differentiating whether women have insurance coverage from a private or government-sponsored source or have no insurance coverage (self-pay) may indicate the resource availability a mother had during her prenatal course. Payment source and subsequent resource availability could influence infant feeding decisions and responses to treatment plans involving devices with a relatively high cost.

Researcher-designed questions about breastfeeding problems, management, and patterns were created in alignment with core lactation consultant practice literature (Wambach &

Riordan, 2016) and in conjunction with an expert in the field of lactation with experience in survey development. From this collaboration, a list of all potential devices a mother could utilize to facilitate infant feeding as well as a list of sources of assistance were created for "Check any that apply" questions, and Likert-type scale options were developed (DeVellis, 2017). The instrument was reviewed for understanding and functionality within REDCap by a panel of nurses and by a focus group of new mothers.

Whereas the standardized BSES-SF measures confidence in breastfeeding skills (BSE) as one construct within the TPB, additional survey questions were designed to address other constructs within the TPB such as factors affecting actual behavioral control and intentions for feeding. The researcher-developed questions allowed the full survey to reflect balance, comprehensiveness, and relevance (Polit & Beck, 2017; Polit & Yang, 2016). In the context of lactation and infant feeding as illustrated by the TPB and BSE theories, having confidence in breastfeeding skills contributes to increased intention which encompasses the duration and level of exclusivity of providing human milk. The amount of actual behavioral control a mother has over infant feeding in the early postpartum period influences her perception of skills and control as well as successful adoption of the behavior. Actual behavioral control was investigated through various questions in the researcher-developed tool. The source of breastfeeding problems ranged from "all with the baby" to "all with me" on a 5-point Likert-type scale with additional choices to indicate no problems or a source other than the mother or the baby. If the source of problems was external to the feeding dyad, participants could indicate "yes" or "no" to options related to behavioral and normative beliefs in the TPB such as lack of knowledge about breastfeeding, either pressure or lack of support from the primary support person or from family and friends, or either pressure or lack of support from healthcare professionals. The participant's

perception of the volume of problems encountered, assistance received, and devices used were all measured on a 5-point Likert-type scale ranging from “none” to “a tremendous amount”.

Intentions and behavior are key constructs in the TPB, and in the context of breastfeeding were assessed by asking participants to describe current and future infant feeding patterns and plans up to and beyond one year. Intention is measured by maternal self-report of the planned infant nutrition source including plans to feed either human milk or a human milk substitute. Researcher-developed survey questions were informed by the Labbok and Krasovec (1990) categories of full human milk feeding, high, medium, or low partial human milk feeding, or no human milk feeding. Labbok and Krasovec (1990) categories quantifying breastfeeding behavior are widely referenced in the research literature such as in a study revealing high breastfeeding self-efficacy scores at 1 week increases the likelihood of exclusively breastfeeding at 4 and 8 weeks postpartum (Wu et al., 2014). Survey items had participants rate their feeding behavior on a Likert-type scale from exclusively breastfeeding to exclusive formula feeding at the present time and for intentions at 1, 3, 6, 9, 12 months and beyond 1 year.

Researcher-Designed COVID-19 Screening Questions

To screen for postpartum distress that may have been exacerbated during the COVID-19 outbreak at the time of recruitment, an amendment to the original protocol incorporated seven researcher-developed questions with Likert-type responses and free text and an open-ended question for additional feedback which stated, “Is there anything else you would like to share about your experience of being pregnant, giving birth, and breastfeeding during the COVID-19 pandemic?” The questions were designed to gage the extent that the COVID-19 pandemic led to added stress, anxiety, and depression during pregnancy, in-hospital birth, and breastfeeding, and the extent to which COVID-19 changed the participants’ experience with these life events. At the

time of creation and inclusion of these questions, significant visitor restrictions were imposed at the study sites. Lactation professionals were also reporting women exhibiting trauma symptoms from fear, family loss and illness, and lack of options for ongoing breastfeeding support. The addition of questions to assess responses to COVID-19 was not anticipated to pose more than a minimal burden due to the concise and voluntary response nature of the questions.

Breastfeeding Self-Efficacy Scale-Short Form (BSES-SF)

The BSES-SF was developed by Dennis (2003) to assess maternal confidence in breastfeeding ability. Items begin with the stem "I can always…" (Dennis & Faux, 1999, p. 402) with a response format on a 5-point Likert-type scale ranging from 1 indicating "not at all confident" to 5 indicating "very confident". Examples of items include: "I can always determine that my baby is getting enough milk", "I can always breastfeed my baby without using formula as a supplement", and "I can always tell when my baby is finished breastfeeding". The 14-item scale was condensed from the original 33-item Breastfeeding Self-Efficacy Scale (BSES; Dennis & Faux, 1999) to address item redundancy. In a sample of 491 Canadian, English-speaking, breastfeeding mothers of term newborns at 1 week postpartum and again at 4 and 8 weeks postpartum, the BSES-SF yielded a Cronbach's alpha of 0.94. The scale mean was 55.88 (*SD* = 10.85) with an item mean of 3.99. The mean inter-item correlation of 0.55 (range = 0.41 to 0.73) showed improvement over the BSES (Dennis, 2003) although test/retest reliability at repeated administrations was not noted. Permission to use the BSES-SF in the current study was received from the developer (Appendix F). In the current study, internal reliability had a Cronbach's alpha of 0.92 (*n* = 123) at initial administration and 0.95 (*n* = 100) at repeat administration. The scale mean was 49.22 (*SD* = 10.72).

Content validity was established with the BSES and remains consistent in the BSES-SF. In a content validity process described by Lynn (1986), three measurement experts and four content experts including two nurses evaluated each original BSES item on a 3-point Likert scale for clarity and relevance to breastfeeding self-efficacy in postpartum mothers. The cumulative content validity index (CVI) score was 0.86 (Dennis & Faux, 1999). Polit & Beck (2017) recommend a scale-CVI of 0.90 to be excellent content validity. The instrument was revised prior to pilot testing based on this content validity review.

Construct validity of the original BSES was assessed by correlation to similar theoretical constructs, exploratory factor analysis yielding a three-factor solution explaining 51% of the variance), and contrasted groups comparison (Dennis & Faux, 1999). As the first step in examining construct validity of the BSES-SF, Dennis (2003) determined factorability by confirming that all correlation coefficients were greater than 0.30 and the Kaiser-Meyer-Olkin (KMO) sampling adequacy index was 0.95 (Polit & Yang, 2016). Exploratory factor analysis with principal components extraction using eigenvalues greater than 1.0, scree test, and orthogonal rotation yielded a one-factor solution explaining 58.35% of the variance (Dennis, 2003). All factor loadings were greater than 0.65.

Construct validity of the BSES-SF was also evaluated through convergent and divergent validity (Polit & Yang, 2016). Significant positive correlations between breastfeeding self-efficacy and self-esteem measured with the Rosenberg Self-Esteem Scale were noted at 1 and 8 weeks postpartum, while negative correlations with maternal mood at 1, 4, and 8 weeks measured by the Edinburgh Postnatal Depression Scale were noted. Additionally, there was a negative correlation at 1 and 8 weeks to perceived stress with the Perceived Stress Scale (Dennis, 2013).

Early postpartum breastfeeding self-efficacy scores have been shown to be predictive of exclusive breastfeeding at 3 weeks (Oliver-Roig et al., 2012). Statistically significant differences were found between scores on the BSES-SF at 1 week and in those continuing to breastfeed (M = 56.39, SD = 10.48) or converting to human milk substitute feedings only (M = 42.58, SD = 13.35) at 4 weeks postpartum (t [481] = 5.56, $p < .001$). Similar results were found in the 8th postpartum week (Dennis, 2003).

An integrative review by Sartorio et al. (2017) found that among six identified instruments to assess attitudes and perceptions of breastfeeding mothers, the BSES-SF is the most proliferatively used. The BSES-SF has been utilized in research in more than ten countries and translated into multiple languages with validation and cross-cultural adaptation (Gerçek et al., 2016; Oliver-Roig et al., 2012). In the U.S., the BSES-SF was determined reliable and valid in a sample of 153 non-Hispanic Black women (McCarter-Spaulding & Dennis, 2010), in 540 low-income non-Hispanic White, non-Hispanic Black, and Hispanic mothers in urban areas (Alghamdi et al., 2017), and with both multiparous and primiparous women in hospitals with and without BFHI status (Hinic, 2016).

Procedures

Information about each phase of the study and the recruitment process was provided to unit leadership and offered in flyer format, at nursing daily huddles, and through collaboration with the unit educator and management at each location for nurses and IBCLCs.

Phase One

The principal investigator (PI) visited the unit on several days for one month to obtain interviews. The charge nurse or IBCLC on the unit identified patients meeting inclusion criteria and asked eligible patients about interest in participation. All women informed about the study

agreed to participate in one scheduled face-to-face interview while they were inpatients on the postpartum unit. The PI visited patients in their rooms at the agreed upon time to explain the study and obtain written informed consent, collect demographic data, and conduct a semi-structured interview lasting up to 45 minutes. Participants were notified they could forego answering any questions and could withdraw from the interview at any time. Each participant was assigned a study identification number for coding of the demographic information, transcript, and field notes. Visitors present in the room at the time of the interview were at the discretion of the patient. Participants also approved a research assistant who was also a nursing assistant on the unit to be in attendance for infant care needs.

An interview guide consisting of researcher developed open-ended questions based on the TPB was utilized (see Table 2 in Chapter 4), with field notes recorded within a day of each interview. Consensus about general impressions of each interview during a peer debriefing with the research assistant post-interview was recorded in field notes to enhance credibility (Creswell & Creswell, 2018). The audio-taped interviews were transcribed verbatim by the PI into data files in the NVivo version 12 software program and original recordings were deleted from the handheld audio recorders.

Phase Two

IBCLCs at both facilities were given training by the PI about the study procedures, inclusion and exclusion criteria, data collection process, and human subjects protection. The training was offered via a PowerPoint presentation sent by email to all IBCLCs in the system and a printed version of the presentation placed for reference in a research notebook in the lactation office. Confirmation of training was monitored by the assistant director of lactation services at each facility and communicated back to the PI through regular email or phone correspondence.

Confidentiality training is completed by all staff members of the health system on an annual basis as part of their employment status.

IBCLCs in the hospital system received a daily census of the feeding type, parity, and gestational age of each postpartum inpatient and were asked to screen participants for the study inclusion criteria. For those women deemed eligible, the IBCLCs were asked to read a brief script about the purpose of the study and distribute a flyer while visiting breastfeeding inpatients as part of their daily workflow. Face-to-face recruitment was preferred to enhance enrollment (Polit & Beck, 2017). A one-page flyer describing the study along with instructions for voluntary enrollment online in REDCap between the first and third day of life of the infant was distributed to postpartum mothers meeting inclusion criteria at each facility. In addition to informing eligible participants that participation or refusal would have no bearing on the care they were receiving in the hospital, the flyer described the process for a follow-up survey two weeks from the initial survey.

A 24-hour time frame for reflecting on infant feeding behavior is recommended for administration of the BSES-SF (Dennis, 2003), and thus the period between the first and third day of life of the infant was selected as the first data collection point. The initial REDCap survey page described the study in a Consent Letter for Expedited Survey Research (Appendix C) enabling an opportunity to give consent for participation followed by the BSES-SF and the researcher-designed survey questions in a self-administered survey process. Study data were collected and managed using REDCap electronic data capture tools hosted at East Carolina University. REDCap is a secure, web-based application designed to support data capture for research studies (Harris et al., 2009). Eligible participants were asked to complete the initial survey 1-3 days postpartum, but responses were accepted until the eighth postpartum day to

capture anyone with delayed-onset lactogenesis II (Nommsen-Rivers et al., 2010). Within early postpartum, lactogenesis II is the time of transition from colostrum to copious secretions of mature milk under endocrine control (Neville & Morton, 2001). Completion of the follow up survey was requested 2 weeks after the initial survey to correspond with establishment of the maintenance phase of breastfeeding under autocrine control through supply and demand mechanisms (Sriraman, 2017) when breastfeeding problems peak (Demirci & Bogen, 2017).

The survey question modules were administered in this order: demographic questions, the BSES-SF, and researcher-developed questions about breastfeeding problems, intervention strategies, and feeding intentions and behavior. A series of questions screening for stress, anxiety, and depression related to COVID-19 were administered in a separate section at the end of the survey and completion of these questions was announced as voluntary. The header for this section alerted participants to a helpline for significant mental health concerns.

The survey instrument in REDCap remained accessible for a period of six months to accept initial and 2-week follow up input. A participant list of email addresses was collected in the secure REDCap database allowing an email reminder (Appendix D) with a follow up survey link to be sent at 12, 14, and 16 days postpartum. REDCap allowed for the second survey event to be linked to the first survey for each participant. In the second survey, inclusion criteria verification and demographic questions were omitted electronically through REDCap functionality.

Due to COVID-19 restrictions on student presence in maternal care areas at the launch of the recruitment phase in July 2020, the PI maintained oversight of the study through email and phone correspondence with unit leadership, a staff education coordinator, and participating IBCLCs. Due to low enrollment in the initial months of the study, a process was negotiated for

the PI to consult with lactation staff or charge nurses for a list of eligible participants and to conduct face-to-face visits once students were allowed to return to the units. Flyers were distributed in this manner as well as by nurses with interest in the study at both sites several times each week beginning in early September 2020. The study flyer was placed in postpartum unit admission packets at the community hospital site where nursing staff and IBCLCs promoted participation in addition to PI unit visits. A total of 600 flyers were distributed between both sites during the five-month enrollment period.

A small incentive of a 3 x 4 magnet frame intended for an infant's picture was offered to the first 150 women expressing interest in completing the first survey. The removable center of the magnet contained tips for early breastfeeding success. The frame was acquired at a cost of $0.70 per item. Participants who completed the second survey were eligible for a drawing for one of four $25 Visa gift cards. The PI elected to include a fifth $25 Visa gift card at the time of the drawing. The PI supplied the incentives as a personal expense. Winners were notified via email, and the gift cards were sent via U.S. Postal Service. All winners were notified through email and provided a mailing address.

Data Analyses

Phase One

Conventional content analysis consisting of first cycle coding of textual data, field notes, and inductive analytic memos to achieve a descriptive summary of the experiences of individuals was the selected data analysis method for this study (Sandelowski, 2000; Sandelowski, 2010). General notes were taken during a first transcript review which identified a variety of broad categories of responses. The elemental, first level method of in vivo coding (Saldaña, 2016) was selected for subsequent review of the transcripts to capture phrasing and expressions unique to

each participant through direct quotes. Process coding, which applies gerunds to concepts and goal-oriented actions, was employed as an additional first-level coding strategy to capture the routines and sequences in decision-making about early infant feeding (Saldaña, 2016).

Initially, codes were grouped among the two broad categories of formulating decisions about breast pump use and visualizing using the pump in particular contexts and environments. Hand-drawn diagrams and thought maps were generated to narrow the codes to categories and then further to a few salient themes (Graneheim & Lundman, 2004; Morse & Field, 1995). A validation strategy consisted of an audit trail of notes about how patterns of codes related to Azjen's TPB (Azjen, 1991; Creswell & Creswell, 2018). The data were coded independently by the PI. Codes, representative quotations, and themes were then reviewed by a research mentor with expertise in qualitative methods and maternal health to promote rigor (Graneheim & Lundman, 2004). Collaborative discussion helped explore and refine themes.

Phase Two

To prepare the data for analyses, all data sets were moved from REDCap into a Microsoft Excel file where they were screened for errors and extreme responses and were cleaned. The data were then loaded into SPSS version 26 where a codebook was prepared by assigning variable names and coding instructions for responses. All data were screened for data errors and outliers, and continuous variables were examined for departures from normality. The treatment of missing data points was resolved with pairwise analyses as appropriate if some data points were missing but values were available for other calculations (Polit & Beck, 2017). Two outliers were removed because the time for completion of the first survey was beyond the expected range of 1-8 days of life of the newborn. Demographic information about the sample population is presented as frequencies and percentages for categorical variables in Table 6 of Chapter 5.

Internal consistency reliability for the BSES-SF scale was computed at administration times 1 and 2. Statistical significance was evaluated with p-values <.05 (Polit & Beck, 2017).

Qualitative data were obtained from open text answers for additional information or comments beyond the available answer choices. Responses supported and extended the numeric data. For example, participants described the context in which they used certain devices to maintain and extend the provision of human milk to their infants. Respondents also recounted experiences receiving assistance from nurses, IBCLCs, and family members. The volume of qualitative data is supportive of continued analysis beyond the scope of this dissertation.

Data Analyses for Research Questions and Sub-questions

1. What is the relationship between a mother's perception of the origin of breastfeeding problems and BSE?
    a. What is the relationship between maternal perception of the *source* of breastfeeding problems and BSE?
    b. To what extent does a mother's perception of the *intensity* of breastfeeding problems influence BSE?
2. To what extent do the techniques and devices to address breastfeeding problems influence BSE?
    a. What is the relationship between a mother's perception of *personal assistance* needed to overcome breastfeeding problems and BSE?
    b. Does a mother's perception of the *quantity of assistive techniques and devices* introduced to treat breastfeeding problems influence her BSE?

One-way between groups ANOVA was used to examine differences in the mean BSES-SF scores among groups at T1 and T2 described in the first two research questions. Groups were

based on maternal perceptions of the source of their breastfeeding problems, intensity of their breastfeeding problems, mother's perception of personal assistance needed to overcome their breastfeeding problems, and perception of the quantity of assistive techniques and devices to treat their breastfeeding problems. If the omnibus F statistic was statistically significant, Tukey's HSD post-hoc test was used to examine all pairs of group means for statistical significance. Homogeneity of variance assumption was examined for each individual test.

Data analysis and preliminary results of research questions 3 and 4 are presented here and will be further addressed in future manuscripts.

3. Does the relationship among perceived intensity of breastfeeding problems, intensity of personal assistance, and quantity of assistive techniques and devices to address breastfeeding problems influence BSE?

Multiple linear regression was used to examine how well the perceived intensity of breastfeeding problems, intensity of personal assistance needed, and quantity of assistive techniques and devices used to alleviate breastfeeding problems predicted breastfeeding self-efficacy (BSE-SF scores) and which of the predictors were the best predictors of breastfeeding self-efficacy. Preliminary analyses were conducted to ensure no violations of the assumptions of normality, linearity, multicollinearity, and homoscedasticity (Polit & Beck, 2017).

A standard multiple linear regression model with three predictors resulted in a R squared of .219 indicating that the three predictors explained 21.9% of the variance in breastfeeding self-efficacy scores, F (3, 118) = 12.28, $p < .001$. Intensity of breastfeeding problems was the only predictor that made a unique statistically significant prediction of variability in BSE-SF scores (*beta* = .474, $p < .001$).

4. Does the relationship among perceived intensity of breastfeeding problems, intensity of personal assistance, and quantity of assistive techniques and devices to address breastfeeding problems influence a mother's current breastfeeding behavior and future infant feeding intentions?

Binary logistic regression was used to examine how well the perceived intensity of breastfeeding problems, intensity of personal assistance needed, and quantity of assistive techniques and devices used to alleviate breastfeeding problems predicted the likelihood that mothers were exclusively breastfeeding at T1 and which of the predictors were the best predictors that the mothers were exclusively breastfeeding. The full model containing all the predictors was statistically significant, χ^2 (3, N = 123) = 27.06, p < .001, indicating that the model was able to distinguish between mothers who reported exclusive breastfeeding and those not exclusively breastfeeding.

The model as a whole explained between 20.3% (Cox and Snell R squared) and 31.3% (Nagelkerke R squared) of the variance. The Hosmer-Lemeshow Test indicated that the data was a good fit to the regression model (Pallant, 2016). The strongest predictors of exclusive breastfeeding were perception of low intensity of breastfeeding problems with an odds ratio of 11.37, 95% CI [1.50, 94.68] and low perceived use of assistive techniques and devices with an odds ratio of 17.23, 95% CI [2.18, 135.29]. Subsequent manuscripts will investigate intentions for exclusive breastfeeding at 1, 3, 6, 9, and 12+ months.

Limitations

The observational nature of this study design with no manipulation of variables and no randomization of samples has the disadvantage of being unable to show causality (Polit & Beck, 2017). Additionally, participants entering the study with an existing low BSE could have been

poised to view their feeding difficulties as more extensive and their situation as needing additional assistance from a healthcare professional. There is also a possibility that participants with less confidence in their skills for breastfeeding could have initiated or requested more tools and devices as a mechanism to address problems. Reverse causality and the influence of confounders has recently been explored in other health-related research such as cardiovascular, obesity, and depression studies (Banack et al., 2019; Jacka et al., 2015; Sattar & Preiss, 2017). Further investigation is warranted to explore the direction of correlation pathways in the current cohort.

Studying only English-speaking racial and ethnic groups limited generalizability. The BSES-SF has multiple reliable and valid translations, however funding for translation resources was limited at the time of the study. A self-report questionnaire format was selected for administration of the surveys in this study. Advantages of this format include participant anonymity, ease and brevity of completion in under 15 minutes, and reduced recall error since feeding sessions for breastfeeding mothers typically occur every 2 to 3 hours. The online format was also cost-effective with expedient input of data into a statistical package. However, a survey does not provide respondents the opportunity to ask for clarification of questions, nor can a researcher ask the respondent for additional information outside of free text boxes. Additionally, devices, terminology such as “breastfeeding problems”, and infant feeding patterns over the last 24 hours were not defined for participants. Therefore, item selection was based on participant perceptions rather than defined parameters and could have been influenced by a low BSE.

In addition to the possibility of selection bias, additional areas of concern for breastfeeding researchers are response bias and social desirability bias (Polit & Beck, 2017;

(Waltz et al., 2017). Like other positive health behaviors, there may be a tendency in breastfeeding research for participants to respond with answers they feel are expected and desired. Social desirability bias was minimized in this study by ensuring eligible participants that their responses were not linked to the provision of any services such as WIC for infant feeding supplies. Potential participants were notified that their responses would be kept confidential and not shared with care providers, family, or published in ways that would identify individual participants. Although exclusion criteria include maternal physical health complications and unexpected surgery, some new mothers may have elected not to participate due to exhaustion or social factors such as disinterest in participation and multiple competing surveys and tasks as part of the in-patient education and discharge process.

This study was conducted during the COVID-19 pandemic. At the outset of the study, little was known about the psychological impact the pandemic had on pregnant and postpartum women. A series of researcher-developed questions with a Likert-type response format assessed stress, anxiety, and depression, and changes to the pregnancy, birth, and breastfeeding experience attributed to COVID-19. At Time 1, 94.4% (n = 118) of participants responded to the optional COVID-19 screening questions. Many also wrote comments highlighting stress, disappointment, and change to the prenatal and birth experience. Most of the comments mentioned visitor restrictions at appointments and support limited to one person present during birth. Although 28 participants reported “a lot” or “a tremendous amount” of stress attributed to the pandemic during pregnancy, only three participants reported “a lot” of stress with breastfeeding. An equally low number of participants (n = 3) reported that their breastfeeding experience had changed “a lot” or “a tremendous amount” related to COVID-19. Overall, the pandemic changed the pregnancy experience “a lot” or “a tremendous amount” for 51

participants and the birth experience for 31 participants. Five participants reported “a lot” of depression during pregnancy related to COVID-19, but no participants noted depression related to breastfeeding during a pandemic. Although no participants were excluded from the study due to significant stress attributed to the pandemic, further studies are needed to explore correlations between changes in pregnancy and birth related to COVID-19 and breastfeeding patterns.

Summary

The studies used qualitative methodology in Phase One and a longitudinal correlational design in Phase Two to investigate tools and devices to facilitate human milk expression, maternal BSE, and a variety of perceptions about breastfeeding problems. Phase One examined beliefs and decision-making processes surrounding breast pumps due to a high prevalence of use in women providing human milk to newborns in the early weeks and months postpartum. In Phase Two, the source and perception of intensity of breastfeeding problems, assistance needed, and volume of devices introduced into the breastfeeding plan of care were assessed. In the quantitative study, electric and manual breast pumps were indeed among the top four devices utilized in the first postpartum week, and an electric breast pump was the most used device by respondents at the time of the follow up survey. Through the TPB and BSE theoretical lenses (Ajzen, 1991; Dennis, 1999), Phase Two examined the influence of BSE on intention to breastfeed when a change in actual behavioral control caused by breastfeeding problems was encountered.

In Phase One, eight women participated in a semi-structured interview. Content analysis was used to represent the data as three themes. In Phase Two, participants were recruited through consecutive sampling over 5 months in two hospitals in the triad region of North Carolina. Eligible participants self-enrolled to complete an online survey of the BSES-SF and researcher-

designed questions in the first postpartum week and a follow up online survey 2 weeks later. Results were analyzed with one-way ANOVAs, multiple regression, and binary logistic regression. The results of the Phase One study are reported in Chapter 4 (manuscript 1) and the results of the Phase Two study are reported in Chapter 5 (manuscript 2).

CHAPTER 4: BELIEFS AND DECISION-MAKING OF FIRST-TIME MOTHERS PLANNING TO USE A BREAST PUMP

This chapter contains manuscript #1 to be submitted to the *Journal of Perinatal Education.* Chapter 4 describes a qualitative descriptive research study about early postpartum beliefs and decision-making processes among first-time mothers regarding breast pumps. The theory of planned behavior was the theoretical model that informed this study. A discussion of the qualitative methodology used in this study, findings, and implications for clinical practice are presented.

Abstract

Beliefs and decision-making processes associated with breast pump use in first-time mothers providing human milk to healthy, term newborns soon after birth are explored in this qualitative, descriptive study. Eight women participated in an individual semi-structured interview in a community hospital in the southeastern U.S. Guided by the theory of planned behavior, conventional content analysis about prenatal and early postpartum beliefs of planning and utilizing breast pumps yielded themes of *Resource Gathering*, *Intention Refining*, and *Behavior Navigating.* An understanding of these beliefs gives insight into ways health professionals can increase collaboration with expectant and new mothers about selection and safe use of breast pumps, resource availability at various stages, and infant feeding goals.

Keywords: breast pump, breastfeeding, first-time mother, decision-making, lactation, theory of planned behavior

Background

Over 85% of women in the U.S. use a breast pump to express human milk between 1.5 to 4.5 months postpartum (Labiner-Wolfe et al., 2008). Exclusive expression with a breast pump and the milk fed by bottle is also a growing trend as a substitute for direct feeding at the breast/chest (Jardine, 2019; Keim et al., 2017). A breast pump is a helpful tool for milk expression when navigating breastfeeding challenges and returning to work or school (Geraghty et al., 2013). For many women, use of a breast pump aids in reaping the extensive infant and maternal health benefits of exclusive human milk feeding to 6 months of age and to a year or beyond as complimentary foods are added (Eidelman & Schanler, 2012; World Health Organization [WHO], 2017).

Fildes (1986) dates milk expression by means other than a baby at the breast to writings by Avicenna (AD 980-1036) and describes the "suckling glass" from the 16th century as one of the first known breast expression apparatuses. A quieter motor, easy portability, and a significant rise in marketing led to an increase in breast pump use beginning in the 1980s (Johns et al., 2013; Obladen, 2012). Today, breast pumps have a global market value of $2.07 billion USD with 6% annual growth. At 53%, North America accounts for the largest market share (Grand View Research, 2020). The Affordable Care Act (ACA) significantly increased the availability of low to no cost breast pumps as well as lactation consulting services in the U.S. (U.S. Centers for Medicare and Medicaid Services, 2018). Initial implementation of the ACA resulted in a 10% increase in the length of time mothers provided human milk and a 21% increase in the duration of exclusive breastfeeding (Gurley-Calvez et al., 2018). However, more information is needed about how the ubiquitous presence of breast pumps influences decision-making about infant feeding. Understanding when and how women plan for breast pump use will give health

professionals and educators insight into increasing the number of breastfeeding mothers reaching key human milk feeding goals (Office of Disease Prevention and Health Promotion, 2020).

The use of breast pumps is not benign; there are potential risks of nipple pain and injury (Clemons & Amir, 2010; Qi et al., 2014), amplified concern about milk volume (Felice et al., 2017), and alterations in maternal/newborn bonding during feeding (Flaherman, Hicks, Huynh et al., 2016). As they work through challenges of breastfeeding, first-time mothers are more likely than women with subsequent children to initiate use of a breast pump within the few days following birth to promote milk supply (Loewenberg Weisband et al., 2017). With nonelective breast pump use, defined as not originally intending to use a pump but doing so for a specific need, shorter durations of human milk feeding were noted along with decreased exclusive breastfeeding (Felice et al., 2016). Among first-time mothers, little is known about prenatal and early postpartum knowledge of breast pump functionality and ways to mitigate problems arising from improper or frequent use.

The term *expression* is used in this paper to indicate use of a breast pump to collect human milk or *hand expression* if obtained by a hand technique. *Breastfeeding* is used for direct breast/chest suckling by the infant, and *human milk feeding* indicates offering human milk by bottle or an alternate feeding device. Ajzen's theory of planned behavior (TPB; 1991, 2006) served as a theoretical basis for the study. In the TPB model, behavioral, normative, and control beliefs converge to form intentions to engage in specific behaviors. Intentions encompass the degree of motivation and the effort a person is willing to exert to perform a behavior. Behaviors can be predicted when people have an intention and both a perceived and actual amount of control over the behavior (Ajzen, 1991).

In-depth interviews about beliefs, decision-making processes, infant feeding processes, and breast pump experiences in the first days postpartum provide insight into the ways breast pump use impacts the landscape of infant feeding intentions and behaviors. The purpose of this qualitative descriptive study was to explore the beliefs and decision-making processes associated with breast pump use in first-time mothers providing full or partial human milk feedings to healthy, term newborns at 24-72 hours after birth.

Methods

Study Design

A qualitative descriptive design was used in this study. Qualitative research methods are founded on naturalistic inquiry to explore motivations, concerns, responses, and reasoning without experimental manipulation of variables (Sandelowski, 2000). It is an appropriate methodology when seeking to understand the context of social issues and the meaning individuals ascribe to experiences (Creswell & Creswell, 2018). Presented and later refined by Sandelowski (2000, 2010), qualitative description often uses the purposive sampling technique and content analysis, underpinned with a theoretical framework, to give a descriptive summary from the words and events in the data (Bradshaw et al., 2017). The goal is to present a description in an order and way that can be validated and easily understood by others for clinical application. (Colorafi & Evans, 2016; Sandelowski, 2000).

Participants and Setting

Eight participants were recruited over a one-month period in the spring of 2019. For inclusion in the study a participant had to be a first-time mother with an infant between 24 and 72 hours old, age 18 or older, English-speaking, and indicated a feeding choice of either breastfeeding or a combination of breast and formula feeding upon hospital admission. Mothers

providing exclusive human milk substitutes or with an infant in the neonatal intensive care unit (NICU) were excluded from the study. Sample size was determined by factors associated with obtaining information power including using an established theoretical framework and having a narrow aim where the targeted population could offer rich experiential data through high quality interviews (Malterud et al., 2016). Purposive sampling led to demographics resembling the local population of childbearing women with 75% returning to full-time employment and planning to use a breast pump (see Table 1).

The setting was an 18-bed postpartum unit of a community hospital in the southeastern U.S. The agency is affiliated with a larger healthcare system from which institutional review board (IRB) approval was granted, along with university medical center IRB approval. Administrative approval from unit leadership was obtained, and staff were informed about the purpose and process of the study prior to data collection.

Data Collection

The principal investigator (PI) visited the unit on several days for one month to conduct interviews. The charge nurse or International Board-Certified Lactation Consultant (IBCLC) on the unit identified patients who met inclusion criteria and inquired about interest in participation. All women informed about the study agreed to participate in one face-to-face interview while they were inpatients on a postpartum unit. The PI visited the participants in their rooms at a scheduled time to explain the study and obtain written consent, collect demographic data, and conduct a semi-structured interview lasting 20-40 minutes. Participants were notified they could forego answering any questions and could withdraw from the interview at any time. A $10 grocery store gift card was given to each participant at the conclusion of the interview. An interview guide (Table 2) consisting of researcher developed open-ended questions based on the

TPB and reviewed by a panel of IBCLCs was utilized, with field notes recorded within a day of each interview. Visitors present in the room at the time of the interview were at the discretion of the participant. Participants also gave approval for a research assistant to be in attendance. Consensus about general impressions of each interview during a peer debriefing with the research assistant post-interview was recorded in field notes to enhance credibility (Creswell & Creswell, 2018). The audio-taped interviews were transcribed verbatim by the PI into data files in NVivo (12).

Data Analysis

Conventional content analysis consisting of first cycle coding of textual data, field notes, and inductive analytic memos to achieve a descriptive summary of the experiences of individuals was the data analysis method selected for this study (Sandelowski, 2000; Sandelowski, 2010). General notes were taken during a first transcript review which identified a variety of broad categories of responses. The elemental, first level method of in vivo coding (Saldaña, 2016) was selected for subsequent review of the transcripts to capture phrasing and expressions unique to each participant through direct quotes. Process coding, which applies gerunds to concepts and goal-oriented actions, was employed as an additional first-level coding strategy to capture routines and sequences in decision-making about early infant feeding (Saldaña, 2016). Initially, codes were grouped among the two broad categories of formulating decisions about breast pump use and visualizing using the pump in particular contexts and environments. Hand-drawn diagrams and thought maps were generated to narrow the codes to categories and then further into a few salient themes (Graneheim & Lundman, 2004; Morse & Field, 1995). A validation strategy consisted of an audit trail of notes about how patterns of codes related to the TPB (Azjen, 1991; Creswell & Creswell, 2018). The data were coded independently by the PI. Codes,

representative quotations, and themes were then reviewed by a research mentor with expertise in qualitative methods and maternal health to promote rigor (Graneheim & Lundman, 2004). Collaborative discussion helped explore and refine themes.

Results

Demographic Composition

The demographic characteristics of the participants are presented in Table 1. Most participants (62.5%) were between the ages of 25 and 30 years. The majority birthed vaginally, but the 37.5% incidence of birthing via cesarean section in this sample is significantly higher than the average of 29.4% for the state (Centers for Disease Control & Prevention [CDC], 2018). Six (75%) White mothers and two (25%) Black mothers participated, and a support person was present during six of the eight interviews. Six participants self-identified as single and two identified as married/partnered. Half of the sample (n = 4) had attended some college, half (n = 4) had private insurance, and six (75%) indicated they planned to return to work full time following 4-12 weeks of family leave. The mean gestational age of the infants at birth was 39.2 weeks (SD = 0.83).

When queried about lactation services participants used during pregnancy or planned to use postpartum, only half (n = 4) indicated support from an IBCLC postpartum even though the hospital provided at least one visit daily from an IBCLC. Three participants were receiving Medicaid as well as benefits from the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) administered through the local county health department. Only one of the participants who received WIC indicated that she planned to follow up with a breastfeeding peer counselor available through the same department. Two participants attended a prenatal breastfeeding class offered at no cost through the hospital.

Themes

Tables 3-5 highlight the themes and subthemes that were further developed to represent the breadth of participant responses.

Theme 1: Resource Gathering

Resource gathering can be described as mobilizing knowledge and finding a support base when an expectant or new mother investigates a particular area involved in infant care. One participant emphasized the volume of prenatal educational material as "All of it is just a ton of information, so when you look at it, you just have to really have time to sit down and process it all." Within the subtheme of *building knowledge*, most mothers began their exploration of breast pumps online after receiving educational materials from a health care provider, notices from an insurance carrier, or seeing references to pumps in online parenting forums. Building knowledge involves gathering the type and quantity of information to determine if using a pump is a viable option for the infant feeding plan. Two participants mentioned that no family members have experience with pump expression. One stated "I didn't really research 'em. I didn't really get into them" and several used multiple methods such as brochures, articles, and YouTube videos as information sources. Internet reviews were the most frequently mentioned method for learning about features and to aide selection.

Participants sought knowledge about the features, price range, and perceived level of complexity of a multitude of breast pumps. After viewing product websites and pumps shown as available options on insurance company websites, some pumps were described as "elaborate" and they "seemed a little too complicated, had a little too much, uh, complexity I guess." Over half of the mothers mentioned initially being drawn to the variety of features and accessories such as carrying bags, "bottles shaped like a breast", "modes", suction power, minimal noise, an

accompanying mobile app, and efficiency. Only two participants discussed upgrading beyond what their health care plan provided as a base. The following quote offers insight into a participant's view of options and accessories:

> Yeah, I guess the most eye catching was all the other accessories that came with the pumps. And of course they have, like, different designs. And like, the [brand A] is like a boxy thing. And then the [brand B] is like this little circly looking one.

Participants divulged that although they were investing significant time in selecting various features, there were still many unknowns about pump functionality and much left to learn after the infant's arrival.

The subtheme of *trusting others* encompasses placing influential value on the opinions and experiences of others about pump type and function, as well as establishing an early network of places to find support. One participant was already active in more than one "mothering group", and another said she "did a bunch of research on reviews of which one, um, like I have the 'what to expect' app." Others indicated heavy investigation through more of a spectator role in online forums during the prenatal period. "I didn't ask a whole lot of questions or I didn't post a whole lot. I just went off of other mothers' stories or questions." Health care professionals were mentioned as a resource for postpartum guidance about pump functionality but not as a primary prenatal source of information. A family member or friend, including a sister-in-law who exclusively pumped for 11 months, was elevated as the primary source of information if the participant had vicarious experiences of knowing about or viewing successful milk expression. "But she's kind of the breastfeeding pro in our family. You know. She's been very helpful, but she, um, she's encouraged me to pump as much as I can."

Theme 2: Intention Refining

Once mothers have considered their resources and weighed options for breast pumps, they come to the point of making the decision about whether to incorporate a pump into the infant feeding plan, including the type and frequency of use. The perceived level of confidence in using the pump is an antecedent to these decisions. Transcripts contained 14 instances of mothers noting that feeding the infant directly from the breast/chest as often and as long as possible was preferred over expressing, "That I could, you know, just skip it [expressing]". Others thought expressing would yield "extra storage" and be a "back up thing if he didn't latch because I know some babies don't." Overall, expression was primarily viewed as a necessity upon return to work and anticipated to take "pure mental determination."

Within the subtheme of *decision making*, when a certain type of pump was selected, trepidation from lack of experience was voiced. "Well in all honesty, to me, there wasn't one that was best. 'Cause I'm a new mom so I don't know what's better than the next. So ultimately in the end, it was just 'get a pump'." However, mothers were surprised at the ease of obtaining a pump. Economic factors heavily influenced procurement decisions for most participants who tried to determine the best pump offered within the covered range for their insurance carrier "and then I just kind of picked one that seemed from the basic info what looked best", "had, like, good reviews and that one just, I don't know, looked nicer." Others selected upgrades offered by their insurance provider, citing the importance of the pump as a tool to maintain milk production at work. No one reported selecting a pump more expensive than one with the highest number of upgrades.

The subtheme of *determining degree of use* is evaluating the level of necessity and amount of persistence expended in using a breast pump. "Because if you need it, then you'll keep

doing it. If it's something that's important to you then you will make it a habit and continue doing it, so I plan to make it a habit." The prevailing plan was to electively begin use as a tool to navigate work schedules. "So, you have to start pumping, you know, before you go back to work because you need to build up a supply or whatever. So that was kind of my plan at first." However, participants weren't opposed to pump use for nonelective circumstances other than returning to work or school. "I mean they're not like, I guess wouldn't be your enemy". "Like the pump is there as a resource for you." One participant indicated she would be open to pump use to aid in the establishment of milk supply "but that would be the only reason that I would use it now while I'm out of work" Another had no definite plans for initiation but "I guess if I feel sore then maybe I'll try pumping early on?"

Theme 3: Behavior Navigating

Just as mothers were overwhelmed with features when selecting a breast pump, beginning pump use was perceived as a time for expert guidance to learn about functionality. As mothers envisioned the context in which they anticipated primary usage, they also identified some obstacles and the need to engage in problem solving to have a successful plan for milk expression. The subtheme *envisioning or engaging use* describes the time when participants first used or thought of using a pump and the incorporation of a breast pump into daily routines. "How in the world you use this thing? [laughing] That would be my catch phrase. And then it's like so much stuff about storage, some of the stuff about bags. Where you gonna store it? How long can you store it?" One mother had a "pretty good understanding of the whole pumping thing", but three other mothers brought a pump with them to the hospital to "try it here before leaving." In addition to assistance from an IBCLC or nurse, trial and error, an instruction guide, and online videos were mentioned as learning modalities. Aside from the youngest participant

who purchased an electric pump prenatally to attempt to stimulate labor, a few mothers admitted feeling overwhelmed and delayed learning about breast pump functions and storage of human milk. In the words of one participant

> So, I was just like 'let me just get through pregnancy, and then let me just get through labor and delivery and then I'll worry about it'. So now I'm starting to think about it, and I'm gonna get my pump out and look at it. Try to figure out how to work it [laughing].

Two mothers briefly mentioned safe storage of expressed milk in the context of needing to learn more about it, but surprisingly these were the only mentions of safety features of pumps or safe handling of milk. "But I haven't thought about that [safety]. [laughing] But I guess that would be important too!"

For working mothers, cars, a classroom during breaks, a staff kitchen or office, and conference rooms were identified as private places for milk expression with a pump. Two of the eight mothers knew of a lactation room at their workplace, while another said it was "going to be really challenging" to find a space. The subtheme s*elf-advocacy* encompasses promoting personal rights to express milk through potential challenges or expected hardships. Three participants and one support person were vocal about abhorring the use of a bathroom as a routine place for pump use. In reference to a bathroom stall, a mother emphatically stated, "because it's loud. I don't have any clean spaces. It's disgusting. I shouldn't have to…You know it's her food. Why am I in a bathroom? That's just gross." Coordinating a schedule for expression times was specific to the type of job and was anticipated to take as much navigation with an employer as finding an appropriate space. One participant felt some stigma associated with using a breast pump at work since the majority of coworkers formula fed their infants, and another said "honestly I don't care because now I have a baby that's depending on me. So, it's not about them

now, as long as my own supervisor knows what I need to do." Participants mentioned potentially having to remind employers about laws and rights of women to express human milk at work at consistent times and in a private location.

Discussion

A variety of new breast pumps entered the market following implementation of the ACA in 2010. Another pivotal event motivated by consumer demand for new pump designs was the 2014 gathering of engineers, parents, and lactation advocates at the "Make the Breast Pump Not Suck" hackathon (Demirci, 2019). In this study, first-time mothers with term, healthy infants 24-72 hours old reported being drawn to the multitude of eye-catching features and accessories when prenatally investigating breast pumps. Findings from this study support Azjen's theory of planned behavior (TPB; 1991; 2006) where prenatal knowledge gained about breast pumps, known as behavioral beliefs, is tempered with a woman's confidence or perceived control beliefs to use the pump and its features. Participants wanted the best breast pump within their financial means, but there was a point where features made some pumps seem too complex.

Heavy reliance on product and manufacturer websites and an inherent trust in online peer reviews characterized pump selection by participants in this study. This further aligns with the TPB (Azjen, 1991; 2006) where a person's impression about the approval of others, known as normative beliefs, influence intention to use a pump. Although some researchers have found that lactation professionals are a primary source of general breastfeeding information (Bridges et al., 2018), results of this study align with others demonstrating that first time mothers primarily seek online peer interaction for pump information, instruction, and esteem-building (Lebron et al., 2020; Wagg et al., 2019).

Even for mothers in this study who had possession of a pump during the immediate postpartum period, focus on tasks of pregnancy and the impending birth delayed the unboxing and exploration of their pump. Although the act of obtaining a pump was characterized as a simple process, selecting one from among a wide variety of choices and then opening and exploring features was daunting to many.

Obtaining a breast pump prenatally or in the early postpartum period is not uncommon. In an Australian study, 46% of first-time mothers acquired a breast pump prior to birth, 60% had a pump within 24 hours after birth, and 47% fed expressed human milk to their infant within the first 24-48 hours of life (Johns et al., 2016). In this study, first-time use was identified among participants as a key moment for IBCLC or nurse involvement. Parents in other studies lament that instructions by health professionals are often confusing, inconsistent, and heighten anxiety about milk production (Dietrich Leurer et al., 2020; Flaherman, Hicks, Huynh et al., 2016, Jefferson & Bibb, 2019). However, mothers in this study were pleased about collaboration with IBCLCs in the hospital and anticipated their use for guidance on expression and milk collection.

Participants did not indicate that the double electric pump motor present in each postpartum room in the study setting influenced their decisions about future use. However, mothers stated they were aware of the possible need to use a pump as an intervention for various breastfeeding challenges. Perceived and actual low milk supply is cited by mothers as the most common problem in the early postpartum period (Huang et al., 2020; Kent et al., 2016; Yamada et al., 2019), and a pattern of pump use is frequently included in the treatment plan (Becker et al., 2015). Indeed, several mothers had been given an accessory pack with instructions to use the breast pump in the hospital for the nonelective reason of stimulating milk production while infant feeding challenges were addressed. Some researchers have indicated women expressing in early

postpartum for nonelective reasons are less likely to meet public health human milk feeding targets (Felice et al., 2016). Similarly, if a pattern of milk expression begins early and continues regularly in non-working women, there is a higher likelihood of earlier breastfeeding cessation and introduction of human milk substitutes (Yourkavitch et al., 2018).

Over 85% of lactating women use a breast pump (Keim et al., 2017; Loewenberg Weisband et al., 2017). With such prevalence, it was surprising to hear minimal references to proper pump function and safe milk collection among study participants. Qi et al., (2014) reported 15% of their sample of 1,844 mothers had injuries or lower than expected output volumes, especially from manual and rental pumps. Inadequate cleaning of the breast pump collection kit and improper milk storage have been reported (Carré et al., 2018). A prenatal or early postpartum learning needs assessment and individualized instruction by a childbirth or lactation educator can decrease incorrect use that may harm skin integrity, hinder milk production, or increase the risk of milk contamination.

Implications for Practice

The Core Competencies in Breastfeeding Care and Services for All Health Professionals (U.S. Breastfeeding Committee, 2010) states that professionals providing primary or secondary care to childbearing women and their infants and children should have the knowledge to "offer strategies to address problems and concerns in order to maintain breastfeeding" (p. 5). They must also "know how and when to integrate technology and equipment to support breastfeeding" (p. 5). Meier et al. (2016) offer a helpful guide for health professionals to individualize pump selection for infant feeding stage and maternal level of pump dependency. Numerous sources including the CDC (2020b), U.S. Food and Drug Administration (FDA; 2020), and La Leche League (2021) publish consumer guides and web-based resources about breast pump cleaning

and milk collection and storage. Expectant and new parents need health professionals to guide them toward trusted sources of information.

Once participants in this study selected a breast pump, they quickly began to anticipate barriers and navigate plans for workplace expression. Top priorities were locating a private space other than a bathroom and negotiating adequate and timely breaks. As patient advocates, educators and other health professionals should provide anticipatory guidance to expectant mothers about provisions of the Fair Labor Standards Act that offer workplace protections for breastfeeding women. Prenatal or early postpartum self-advocacy and planning is essential for women employed in companies of less than 50 people not covered by the FLSA (U.S. Department of Labor, 2010).

Conclusion

The goal of this research study was to gain insight into beliefs and factors influencing decision-making regarding breast pumps and their use by first-time mothers. Sufficient information power was sought for this pilot, but the sample size was still limited. Although exclusion criteria included major physical and health limitations, some new mothers may have curtailed their conversations due to post-birth fatigue or family visitation. Additionally, social desirability bias could have influenced mothers to provide positive feedback about pumps (Bergen & Labonté, 2020).

This study offers information about how first-time mothers select and formulate plans to use breast pumps. An understanding of these beliefs gives insight into ways childbirth educators and other health professionals can increase collaboration with expectant and new mothers about feeding goals and anticipation of resource needs. There is an opportunity for nurses, lactation experts, and other health professionals to enhance education about proper selection and safe use

of breast pumps as well as give mothers tools for negotiating breast pump use while at work to extend the provision of human milk.

Table 1

Descriptive Characteristics of Participants (N = 8)

Characteristics	*n*	%
Maternal age (years) [a]		
18-24	2	25
25-30	5	62.5
31-35	1	12.5
Mode of Birth		
Vaginal	5	62.5
Cesarean	3	37.5
Infant birth weight [b]		
5lb – 6lb 15oz	4	50
7lb – 8lb 15oz	4	50
Infant gender		
Male	3	37.5
Female	5	62.5
Race/Ethnicity		
White	6	75
Black	2	25
Marital status		
Single/Divorced	6	75
Married	2	25
Employment status		
Full-time (40 ±hours/week)	6	75
Part-time (< 40 hours/week)	1	12.5
Unemployed	1	12.5
Education level		
High school or GED	1	12.5
Some college/Associates Degree/Bachelor's Degree	5	62.5
Graduate Degree	2	25
Health insurance coverage		
Private insurance	4	50
Medicaid	3	37.5
Private insurance + Medicaid	1	12.5
Actual or anticipated services [c]		
WIC	3	37.5
Breastfeeding class	2	25
Breastfeeding Peer Counselor	1	12.5
Lactation Consultant	4	50

[a] Mean maternal age 26.25 years (*SD* = 4.95). [b] Mean infant birth weight 7lb 2oz (*SD* = 1lb 4oz).

[c] Participant could select >1 answer choice

Table 2

Interview Guide

Prompts to guide the interviews
• Tell me about your plans for feeding your baby.
• Have any of your plans for feeding or using a pump changed since you have had your baby?
• Thinking back through pregnancy and the time since birth, tell me about your process for deciding if and when you might use a breast pump.
• During pregnancy and the time since birth, how did you learn about the types of breast pumps and how to use them?
• What do the important people in your life think about breast pumps or about feeding the baby any way other than at the breast?
• What do you believe mothers specifically want to know about breast pumps?
• How will you obtain a breast pump if you want to use one?
• What might get in the way of your plans to use a pump?
• If you think you might use one, what will help you be successful at incorporating a breast pump into your infant feeding plans?
• What are your thoughts about breastfeeding and about breast pump use in our society at this time?
• Is there anything else you want to share with me about your thoughts and decisions about breast pump use?

Table 3

Theme 1: Resource Gathering

Sub-themes	Example Quotes
Building knowledge	"I had contacted my insurance early on and they sent me a list in the beginning of what options and then the different upgrades. So at least I had a guideline of what to look for or the brand names."
	"So, it has a battery-operated option. I like that it's a closed system, which I guess is cleaner? I don't really know."
	"So, I am gonna try to get one that's very discreet. And, um, fashionable, hopefully…That's not just a big, bulky like hospital looking thing."
	"I guess I didn't really know quite what or when to pump or whatever. "
	"I think maybe in person, if I had like the lactation consultant, show me because that's like really the best way for me to learn. And just having videos to go back to later because probably if they had told me how to use it there, I would have just forgotten by the time I get home anyway."
	"Just understanding the pump itself and the process. If that makes sense? So, if I know everything that the pump can, everything that the pump can do, then I can take advantage of utilizing everything."
Trusting others	"These sites are more so another parent and another mother's experience. *Personal experience* [emphasis added]."
	"I mean I've seen other moms post about their preferences between [brand A] or [brand B] or I don't even know any other pumps out there."
	"Talking to my sister in law. She's a labor and delivery nurse, here. Um, and so, I honestly didn't do any research. I took her advice on what to do."
	"I'll probably go to my sister in law who is already a mom (chuckling), …First I'll try to figure it out myself. But then I will seek out help from other mamas who know how to use it."
	"I've heard from a lot of people that it's great doing it in the car, that they've had no issues."
	"My manager did. She's like the only woman though. The men, they don't understand."
	"Her dad's here. I think he thinks I'm a quit because I'm going to get over, or I'm gonna get tired with it. So I don't think he thinks I will keep up with it."

Table 4

Theme 2: Intention Refining

Sub-themes	Example Quotes
Decision making	"I think that feeding directly is certainly good. I think it adds a bond to you and her. But I don't think that not being able to do that all the time detracts from it either. It just makes it…it's not that you're constantly gonna be able to do that so being able to use a pump is awesome. You're just kind of doing what you've got to do. I don't think it takes away anything. It's great."
	"I looked at what my insurance provided because you can't just, you know, buy a pump and they pay for it. You have to select the ones they offer."
	"The ones that are hands free are kind of expensive and insurance companies don't cover them. "
	"But I thought, If I'm going to do it, my best chances of being successful at it at work if I have challenges are going to be with the very best pump available. So I knew it was worth the investment for me."
	"Mine was actually a little bit more of an upgrade, but again because it had all, none of the other ones had everything I wanted, like a closed system, the battery, the powerful section, the good reviews. And it was the only one that had everything. I really didn't want to compromise something that was like this important and that does have a high failure rate and I know will be really challenging for me. I just wanted to go for the very best one."
Determining degree of use	"Just for us moms that *have* [emphasis added] to go back to work, that I *can't* [emphasis added] stay home with him 24-7, um, 'cause you know you have to pay bills."
	"I guess a lot of women would have to stop breastfeeding like super early if their employer doesn't allow them to pump at work. …And then you know some people have to go back to work after 6 weeks of disability and you know if you don't have a pump then you have to quit. So, um yeah, so I feel like now pumps are kind of necessary if you're going to breastfeed and work.
	"The fact that some people can't breast feed and they have the option to pump is wonderful."
	"Yes, I didn't expect to use one so soon, um, and, um, I guess I also didn't expect to need to use formula, but we're, you know, supplementing I guess because we have to."
	"Like I said, I wasn't planning on using it unless I needed it, desperately, kind of thing."

Table 5

Theme 3: Behavior Navigating

Sub-themes	Example Quotes
Envisioning or engaging use	"Yeah. I don't know what I'm doing, but…and there's *a lot* [emphasis added] of different stuff, a lot of different options with pumping."
	"I guess I really didn't know anything, and I still don't know. As bad as that sounds…. So, I'm planning to figure it out in the next few days, so yeah, yeah, I didn't even get into looking at videos or how it worked or anything."
	"I mean, I guess I expect if I have questions about that when the time comes that I can reach out to the lactation consultant or something and, and they would have the answers for me about storage and all the things that what would go in a pamphlet or what would, you know. How would we store the milk right after its pumped? How would you start long term?"
	"I guess, first of all, I guess I need to learn how to do it, (laughing) and then I'll realize if I need any extra support in that way. So, I guess if it's a good pump that'll help, help me, which is why I wanted to get like what the review said was the best one. I thought that would make you successful."
	"So now that we didn't open it, that will be my next stop when I get home. Go through the manual, play with it, set it up, then go ahead and go to YouTube."
	"I mean most people I talked to pump said that they *preferred* [emphasis added] to go to their car. …and they have don't have to deal with anybody…And you can lock the doors and feel safe in a car, I mean its broad daylight."
Self-advocating	"I've talked to them about it and they've said they can give me some time for it but the law says that you can't use the bathroom, um that they've got to give a room for you but they try to offer you the bathroom. I'm like "no, that's not what the law says". I'm worried they won't give me the proper room and comfort that I need to be able to do that."
	"Um, knowing that my job will allow me to, the time that I need to get things right. You know, making my schedule *consistent* [emphasized added]. A consistent schedule."
	"Then you could easily say, "Look, I don't want this to be an issue, but this is kind of state law. While I'm happy to do my work, I need a place to do this."
	"A lot of my friends are supervisors in my company. So, they have already given me a heads up on what I can and cannot do. Or what can be allowed, or of my rights that I have as a new mother pumping."

CHAPTER 5: BREASTFEEDING SELF-EFFICACY, SOURCE OF PROBLEMS, AND TECHNIQUES AND DEVICES TO FACILITATE BREASTFEEDING IN EARLY POSTPARTUM

This chapter contains manuscript #2 to be submitted to the *Journal of Obstetric, Gynecologic, and Neonatal Nursing* (*JOGNN*) for consideration. The descriptive, longitudinal, correlational study of 123 postpartum women consisted of a survey of researcher-developed questions and the Breastfeeding Self-Efficacy Scale – Short Form (BSES-SF) administered in the first few days postpartum with a follow up survey 2-3 weeks after the initial survey. The study examined relationships among breastfeeding self-efficacy and maternal perceptions of the sources of breastfeeding problems, perceived intensity of problems, assistance needed to overcome breastfeeding challenges, and perceived and actual amount of techniques and devices needed to treat breastfeeding problems in the early postpartum period.

Abstract

Objective: To examine relationships among breastfeeding self-efficacy and maternal perceptions of the sources of breastfeeding problems, perceived intensity of problems, assistance needed to overcome breastfeeding challenges, and perceived and actual quantity of techniques and devices needed to treat breastfeeding problems in the early postpartum period.

Design: Descriptive, longitudinal, correlational survey.

Setting: A tertiary care women's hospital and a community hospital in the Southeastern United States.

Participants: A total of 123 English-speaking postpartum women.

Methods: Eligible participants were offered a flyer while inpatients on the postpartum unit and invited to self-enroll in an online survey consisting of the Breastfeeding Self-Efficacy Scale – Short Form (BSES-SF) and researcher-developed questions about demographics, breastfeeding experiences, intentions, and the impact of COVID-19 on pregnancy, birth, and breastfeeding. Participation in a follow-up survey was requested 2 weeks after the initial survey. Descriptive statistics and analyses of variance were used to evaluate the study variables within the theory of planned behavior and breastfeeding self-efficacy theory.

Results: The perception of problems originating from a maternal source or equally from maternal and infant origins were associated with lower mean BSES-SF scores. The lowest mean BSES-SF scores were noted in women reporting a higher intensity of breastfeeding problems, and only modest improvements in breastfeeding self-efficacy (BSE) were noted at the time of the follow up survey. There was no relationship between BSE and the perceived level of assistance needed to overcome problems. Low BSE was noted in women who were using six or more techniques and devices to overcome breastfeeding challenges at 2-3 weeks postpartum.

Conclusion: Targeted BSE screening and interventions are warranted for women who report a lot of breastfeeding problems and are steadily increasing their use of assistive techniques and devices in the early postpartum period.

Keywords: breastfeeding; breastfeeding difficulties; breastfeeding support; breast pump; lactation management; postpartum; self-efficacy; Theory of Planned Behavior

Background

Breastfeeding challenges are reported by up to 92% of new mothers with problems peaking by the third postpartum day (Wagner et al., 2013). Common breastfeeding problems include difficulty with infant latch, pain, limited prior experience with breastfeeding, and perceived low milk supply (Colombo et al., 2018; Feenstra et al., 2018; Kent et al., 2016; Stuebe et al., 2014). Nurses and lactation professionals collaborate closely with women in the early postpartum period to promote breastfeeding and address complications to achieve feeding goals. The current nutritional recommendation by the American Academy of Pediatrics (AAP) Section on Breastfeeding is for infants to receive human milk exclusively for the first six months of life and then to continue to do so as complementary foods are introduced, at least until the child reaches the age of one year and as mutually desirable thereafter (Eidelman & Schanler, 2012). This statement is affirmed by other national organizations such as the American College of Obstetricians & Gynecologists (ACOG, 2018) with the recommendation expanded to two years by international organizations including The World Health Organization (WHO, 2017) and the United Nations Children's Fund (UNICEF, 2003).

Human milk is the ideal nutrition source throughout and beyond the first year of life. Initially, IgA, lactoferrin, and oligosaccharides in colostrum boost immunity and promote an optimal neonatal intestinal microbiota (Bardanzellu et al., 2017; Gopalakrishna & Hand, 2020). Human milk offers protection against severe respiratory infections (Horta & Victoria 2013) and a reduction in otitis media in the first two years of life (Bowatte et al., 2015). Women also experience cumulative benefits from breastfeeding including a reduction in incidence of premenopausal breast cancer, ovarian cancer, and type 2 diabetes (Chowdhury et al., 2015; Stuebe, 2009). Conversely, a shorter duration of breastfeeding correlates with an increased risk of postpartum depression, retained gestational weight gain, and metabolic syndrome (Chowdhury

et al., 2015; Stuebe, 2009). Although 84.1% of women initiate breastfeeding in the United States on the first postpartum day to begin achieving maternal and infant health benefits, only 63.6% are providing human milk exclusively by day seven (Centers for Disease Control and Prevention [CDC], 2018).

When human milk substitutes are introduced for poor infant weight gain or a reduction in maternal milk supply, a decrease in the duration of human milk feedings is seen among mothers who intended to exclusively breastfeed (Chantry et al., 2014). A similar pattern of decreased duration of the provision of human milk is seen with the use of a nipple shield (Kronborg et al., 2017) and a breast pump (Bream et al., 2017; Felice et al., 2016; Yourkavitch et al., 2018) to address feeding difficulties. The introduction of devices into an infant feeding plan of care prompts increased collaboration between parents and providers in accordance with the Core Competencies in Breastfeeding Care and Services for All Health Professionals (United States Breastfeeding Committee, 2010). However, mothers lament that instructions by health professionals are often confusing, inconsistent, and heighten anxiety about milk production (Dietrich Leurer et al., 2020; Flaherman, Hicks, Huynh et al., 2016, Jefferson & Bibb, 2019). A greater understanding of the personal assistance needs of new mothers to navigate feeding challenges is vital for extending the duration of exclusive breastfeeding. Furthermore, the effect of interventions and devices in the early postpartum period on confidence in breastfeeding abilities is not well understood.

Self-efficacy, as a component of perceived behavioral control in Ajzen's (1991, 2002) theory of planned behavior (TPB), can be applied to breastfeeding as a modifiable factor to increase intention to breastfeed and sustain breastfeeding behavior (Glassman et al., 2014). The Academy of Breastfeeding Medicine encourages assessment and behavioral interventions to

promote breastfeeding self-efficacy (BSE) (Rosen-Carole & Hartman, 2015) since higher baseline self-efficacy as well as targeted interventions to promote BSE increase the rate and duration of exclusive breastfeeding (De Roza et al., 2019; Piro & Ahmed, 2020; Shiraishi et al., 2020). Both maternal and infant contributions to the breastfeeding dyad are essential to ensure a robust milk supply for infant growth and development, and few studies have explored BSE differences based on maternal perception of whether problems originate with the infant, themselves, or are a shared burden.

Although James et al. (2020) noted that having initially high BSE aids in overcoming breastfeeding challenges, self-efficacy is up to 2.7 times lower when women experience breastfeeding problems (Aghdas et al., 2014; Hinic, 2016). The use of an assistive technique or device to intervene for breastfeeding problems has independently been shown to contribute to decreased BSE and early breastfeeding cessation (Feenstra et al, 2018; Keemer, 2013). The effect on BSE after a complex feeding plan with multiple interventions is introduced has not been well studied. The paucity of studies about the origin of breastfeeding complications and their corresponding treatment regimens on BSE and feeding intentions indicates more research is needed in this area (Feenstra et al., 2018; Zhu et al., 2017). The purpose of this study was to investigate how maternal perceptions of problems in the early postpartum breastfeeding experience and the techniques and devices used to address those problems influence breastfeeding self-efficacy in mothers providing human milk to healthy, term newborns.

Theoretical Framework

The theoretical framework of BSE (Dennis, 1999) along with the TPB (Ajzen, 1991, 2002, 2006) were used to explore maternal confidence in breastfeeding when problems occur, and a plan of interventions is introduced to address those complications. In the TPB, behavioral

beliefs (attitudes toward a behavior), subjective norm (weight ascribed to the opinions of influential others), and perceived behavioral control (PBC) that shapes an individual's beliefs about how behaviors are manifested all work in concert to moderate intentions to engage in specific behaviors. In the original TPB model (Ajzen, 1991), perceived behavioral control arose from control beliefs which are perceptions of factors that could either help or hinder performance of the behavior. Ajzen (2002, 2020) further clarified and provided evidence of PBC as a two-factor model including self-efficacy and perceived controllability. In the context of breastfeeding, PBC is a product of self-efficacy or an individual's confidence in the ability to be successful at the task of breastfeeding, and controllability or the perception of the level of control the individual has over success at the behavior within either the present or anticipated state.

A person may have confidence in the ability to perform a particular behavior yet have constraints limiting the opportunity to be successful. The construct of actual behavioral control represents factors such as monetary costs and resource availability and is positioned between perceived behavioral control and behavior in the theoretical model of the TPB. Behaviors can be predicted when people have intention as well as both perceived behavioral control and actual control over a behavior (Ajzen, 1991, 2006). BSE is a modifiable attribute for nurses and lactation specialists to consider when designing programs to support breastfeeding mothers and help them attain their feeding goals (Bandura, 1977; Glassman et al., 2014; Shiraishi et al., 2020).

Specific to breastfeeding, the TPB has been utilized in descriptive, quantitative, and implementation research (Bartle & Harvey, 2017; Lau et al., 2018; Johnson-Young, 2019; Zhang et al., 2009). In this study, the TPB and BSE theories (Dennis, 1999) were used as theoretical frameworks to design the research questions and determine investigation points. BSE theory

enhances the TPB through a more detailed description of intention that includes choice of behavior, effort expenditure and persistence, thought processes, and emotional reactions (Dennis, 1999). In the context of lactation and infant feeding as illustrated by the TPB, having confidence in the skills of breastfeeding to successfully achieve goals for duration and level of exclusivity of providing human milk may be influenced by the amount of actual behavioral control a mother has over feeding in the early postpartum period.

This study incorporated concepts from the BSE theory and TPB by measuring confidence in breastfeeding skills with the Breastfeeding Self-Efficacy Scale-Short Form (BSES-SF). Actual behavioral control was explored by measuring the source and intensity of breastfeeding problems and use of assistive techniques and devices within the plan of care to address those problems. Once a behavior such as breastfeeding is initiated, both Ajzen (2020) through clarifications of the TPB, and Dennis (1999) recognized an iterative process or feedback loop that involved returning to beliefs and antecedents for repeated performance or abandonment.

Methods

Study Design

A correlational, longitudinal survey design was used to explore non-modified variables at time points two weeks apart in the early postpartum period. The University and Medical Center Institutional Review Board at East Carolina University as well as the Institutional Review Board for the health system facilities used in this study reviewed and approved the study.

Setting

The study was conducted at facilities offering perinatal and lactation support services in a large hospital system in the southeastern United States. Approximately 7,000 births occur annually in the system (PQCNC, 2013) with breastfeeding initiation rates over 80% at both

facilities (Cone Health, 2014). The larger hospital has Baby-Friendly Hospital Initiative designation (Baby-Friendly USA, 2021), and the community hospital was in the process of attaining the designation. The Baby-Friendly Hospital Initiative designation indicates that the Ten Steps to Successful Breastfeeding are implemented as the standard of care to promote and support breastfeeding (WHO, 2018). An International Board-Certified Lactation Consultant (IBCLC) was present on the postpartum units daily to offer expert guidance on infant feeding to supplement breastfeeding care provided by Registered Nurses (RNs). The average length of stay for patients in the study settings after a vaginal birth was 24-48 hours and 48-72 hours for cesarean birth. Families have follow-up care with a pediatrician and obstetrician or midwife. The hospitals are in neighboring counties, each with a public health department where the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) offers nutritionists and breastfeeding peer counselor services for women who qualify based on financial need. Outpatient IBCLC consultations are available at each hospital in person or by phone and were extended to include telehealth visits during the coronavirus pandemic.

Sample

Participants were eligible for inclusion if their primary language was English, they were greater than 18 years old, were primiparous or multiparous following a vaginal or cesarean birth, were feeding any human milk, and had birthed an infant greater than 37 weeks gestation. Participants were excluded if they indicated upon hospital admission that they intended to exclusively feed human milk substitute, had maternal health complications or unexpected surgery following the birth, or the infant was transferred to a specialty care nursery unit. Using a

power analysis for correlation and assuming a power of 0.80, significance (α) set at .05, and a medium effect size of 0.20, the target sample size was 124 participants (Polit & Beck, 2017).

Measures

The survey instruments to assess study variables were a researcher-developed tool and the standardized BSES-SF. Inclusion criteria of having a term newborn not requiring specialty care were verified within initial researcher-developed demographic questions. Additional demographic questions ascertained amount of breastfeeding experience, type of birth, maternal age, infant age at the time of the survey, educational status, race/ethnicity, and insurance source. Demographic and survey instruments used in this study were completed in approximately 15 minutes. The follow-up survey, accessed through a link in an email, mirrored the initial survey with the exclusion of demographic questions. The surveys were accessed and completed online via HIPAA-compliant Research Electronic Data Capture (REDCap) software. The instrument was reviewed for understanding and functionality within REDCap by a panel of nurses and by a focus group of new mothers. The BSES-SF combined with researcher-designed items for the current study yielded a 46-item research tool with an 8th-grade reading level on the Flesch-Kincaid scale (WebFX, 2019).

Researcher-Developed Tool

Researcher-designed questions to assess breastfeeding problems, management, and patterns were developed in alignment with core lactation consultant practice literature (Wambach & Riordan, 2016) and in conjunction with an expert in the field of lactation. Survey questions were designed to address constructs within the TPB and BSE theories such as beliefs, factors affecting actual behavioral control, and intentions for infant feeding. The source of breastfeeding problems ranged from “all with the baby” to “all with me” on a 5-point Likert-type scale with

options to indicate no problems or a source other than maternal or infant origin. Participants then had the option to indicate specific sources of problems external to the feeding dyad. Perception of the amount of problems encountered, assistance needed, and devices used were all measured on a 5-point Likert-type scale ranging from "none" to "a tremendous amount". Sources of assistance and specific types of techniques and devices used to manage breastfeeding problems could be selected from lists. Informed by the Labbok and Krasovec (1990) categories of full, high, medium, or low partial human milk feeding, or no human milk feeding, survey items instructed participants to rate their breastfeeding behavior on a Likert-type scale at the present time and for intentions at 1, 3, 6, 9, 12 months and beyond 1 year in terms of the amount of human milk supplied to the infant.

To screen for stress, anxiety, depression, and significant changes in the pregnancy, birth, and breastfeeding experiences attributed to the COVID-19 pandemic, the survey incorporated seven researcher-developed questions with Likert-type responses and open-ended questions. Pandemic-specific questions were determined to be necessary due to significant visitor restrictions that were imposed at the study sites. In addition, lactation professionals at the study sites reported that some women exhibited trauma-like symptoms that they perceived were due to fears about the pathogenesis of the virus, family loss and illness, and difficulty accessing ongoing breastfeeding support.

Breastfeeding Self-Efficacy Scale-Short Form (BSES-SF)

The 14-item BSES-SF tool was developed by Dennis (2003) to assess maternal confidence in breastfeeding ability. Items begin with the stem "I can always…" (Dennis & Faux, 1999, p. 402) with a response format on a 5-point Likert-type scale ranging from 1 indicating "not at all confident" to 5 indicating "very confident". Examples of items include: "I can always

determine that my baby is getting enough milk", and "I can always breastfeed my baby without using formula as a supplement". Total scores on the BSES-SF can range from 14 to 70 with lower scores indicating a lower level of BSE (Dennis, 2003). The original 33-item BSES was condensed to the 14-item BSES-SF, with a Cronbach's alpha internal consistency reliability estimate of 0.94 at 1 week postpartum and again at 4 and 8 weeks postpartum (Dennis, 2003). Psychometrics of the BSES-SF revealed a scale mean of 55.88 (SD = 10.85) with an item mean of 3.99 (Dennis, 2003). Permission to use the BSES-SF was received from the developer. In the current study, the Cronbach's alpha was 0.92 (n = 123) at initial administration and 0.95 (n = 100) at repeat administration. The scale mean was 49.22 (SD = 10.72). A 24-hour time frame for reflecting on infant feeding behavior is recommended for administration of the BSES-SF (Dennis, 2003), and therefore the period between the first and third day of life of the infant was selected as the first data collection point.

The BSES-SF has been utilized in research in more than ten countries and translated into multiple languages with validation and cross-cultural adaptation (Gerçek et al., 2016; Oliver-Roig et al., 2012). In the U.S., the BSES-SF was determined reliable and valid in a sample of 153 non-Hispanic Black women (McCarter-Spaulding & Dennis, 2010), in 540 low-income non-Hispanic White, non-Hispanic Black, and Hispanic mothers in urban areas (Alghamdi et al., 2017), and with both multiparous and primiparous women in hospitals with and without BFHI status (Hinic, 2016).

Procedures

IBCLCs at both facilities were given training by the PI about the study procedures and were asked to screen inpatients for inclusion criteria. For consecutive sampling, the IBCLC or PI read a brief script to all eligible participants about the purpose of the study and distributed a one-

page flyer with instructions for voluntary online enrollment in REDCap between the first and third day of life of the infant. REDCap is a Health Insurance Portability and Accountability Act (HIPAA) compliant, web-based application designed to support data capture and management (Harris et al., 2009). Additionally, the study flyer was placed in postpartum unit admission packets at the community hospital site during the last 2 months of the study. A total of 600 flyers were distributed between both sites during the five-month enrollment period. Eligible participants were asked to complete the initial survey 1-3 days postpartum during the time of colostrum production and transition to secretions of mature milk under endocrine control (Neville & Morton, 2001). Responses were accepted until the eighth postpartum day to capture anyone with delayed-onset lactogenesis II (Nommsen-Rivers et al., 2010). Completion of the follow up survey was requested 2 weeks after the initial survey to correspond with establishment of the maintenance phase of breastfeeding under autocrine control through supply and demand mechanisms (Sriraman, 2017) when breastfeeding problems peak (Demirci & Bogen, 2017).

The initial REDCap survey page described the study and presented a letter of consent. Survey question modules were administered in this order: demographic questions, the BSES-SF, and researcher-developed questions about breastfeeding problems, intervention strategies, and feeding intentions and behavior. A series of voluntary questions screening for stress, anxiety, depression, and changes in pregnancy, birth, and breastfeeding related to COVID-19 were administered in a separate section at the end of the survey. A hotline phone number for those experiencing mental health concerns or suicidal ideation was listed at the top of the survey for distress related to COVID-19. Up to three email reminders with a follow up survey link were sent two weeks after the completion of the first survey.

The recruitment script and informed consent document in REDCap notified all potential participants that electing not to participate in the study would have no detrimental effect on their nursing or medical care. Participants had the option to end the questionnaire prematurely or to omit questions. Anonymity was maintained by assigning each participant response set a numeric identifier in the database. There was no cost to participate in the research study. A magnet frame was offered to the first 150 eligible participants, and participants who completed the second survey were eligible for a drawing for one of five $25 Visa gift cards. Contact information for the lactation office at each hospital was listed as a resource in reference material for the study. Participants were directed to contact their obstetrician or midwife for personal concerns or their pediatrician for infant health and feeding concerns.

Statistical Analysis

IBM SPSS version 26 was used to conduct analyses. All data were screened for data errors and outliers, and continuous variables were examined for departures from normality. The treatment of missing data points was resolved with pairwise analyses as appropriate if some data points were missing but values were available for other calculations (Polit & Beck, 2017). A *p*-value < .05 was considered statistically significant. Additionally, internal consistency of the BSES-SF was analyzed at survey administration times 1 and 2 (Polit & Beck, 2017).

One-way between groups ANOVA was used to examine differences in the mean BSES-SF scores among groups based on maternal perceptions of the source of their breastfeeding problems, intensity of breastfeeding problems, maternal perception of personal assistance needed to overcome breastfeeding problems, perception of the quantity of assistive techniques and devices to treat their breastfeeding problems, and actual number of techniques and devices used. Separate analyses compared groups based on responses early in the postpartum period (T1: 1-8

days postpartum) and later in the postpartum period (T2: 13-42 days postpartum). If the omnibus F statistic was statistically significant, Tukey's HSD post-hoc test was used to examine all pairs of group means for statistical significance. Homogeneity of variance assumption was examined for each individual test.

Results

The accessible population birthing at or after 37 weeks gestation within the hospital system was 3,044 women from July 1 until November 30, 2020. The first survey was initiated by 125 (20%) of the approximately 600 women who met the eligibility criteria and received a flyer. The follow up survey 2 weeks later had a retention rate of 80% (n = 100). Two outliers were removed because the time for completion of the initial survey was beyond the accepted range of 1-8 days of life of the newborn.

Table 6 presents the demographic composition of the sample. The maternal mean age was 29.69 years (SD = 5.15). Nearly half of participants (48.8%) reported that this was their first breastfeeding experience. Most participants had some college to post-bachelor's education (84%) and had private insurance (69.9%). The primary source of breastfeeding education was from a health care provider (43.1%) or an online source (21.1%), and 18.7% attended a prenatal breastfeeding class. The sample was predominately White (65%) and African American (21.1%), aligning closely with the accessible population of White (60%) and African American (22%) postpartum women at the two study sites. The initial survey (Time 1) was completed by 92.7% of respondents by the fourth postpartum day and 7.2% by 8 days postpartum. The follow-up survey (Time 2) was completed between 13 – 42 days postpartum, with 85% of the respondents at 13 – 20 days postpartum, 14% at 21 – 26 days postpartum, and 1 at 42 days. The cesarean rate

for participants (33.4%) was slightly higher than the approximate rate of 25% among the accessible population for the two study sites (Quality Check, 2020).

Table 7 presents the means, standard deviations, and two one-way between-groups analysis of variance comparing the mean BSE among groups based on sources of breastfeeding problems reported by participants early in the postpartum period at Time 1 (T1: 1-8 days postpartum) and later at Time 2 (T2: 13-42 days postpartum). In the early postpartum period, there was a statistically significant difference in BSE scores for the four sources of breastfeeding problems groups: F (3, 119) = 11.94, $p < .001$. The effect size calculated using eta squared was .23 indicating a large effect. Post-hoc comparisons using the Tukey HSD test indicated that the mean BSE for participants who reported not having any breastfeeding problems was significantly different than participants who reported mostly maternal problems or had problems evenly split between a maternal and infant origin. There was also a significant difference between participants who reported problems were primarily related to the infant and those reporting problems were split between the mother and infant. The lowest mean BSE scores were observed in women who reported that problems were primarily maternal in origin and those for whom problems were evenly split between a maternal and infant origin. The highest BSE scores were observed in women who reported no problems and in those whose breastfeeding problems originated from the infant. A similar pattern persisted at T2, where there was a statistically significant difference in BSE scores for the four groups: F (3, 119) = 11.94, $p < .001$ and a large effect size (eta squared = .16). The post-hoc comparisons indicated significant differences between participants reporting no problems and those reporting problems of a maternal origin, no problems and those reporting an even split between maternal and infant origin, and between those reporting an even split and problems of a maternal origin.

Table 8 presents one-way between-groups analyses of variance comparing the mean BSE among groups based on perceived level of intensity of breastfeeding problems reported by participants early in the postpartum period (T1) and later (T2). In the early postpartum period, there was a statistically significant difference in BSE scores for the three ("none", "few", and "some" to "a lot" of breastfeeding problems) groups: F (2, 120) = 25.89, $p < .001$ with a large effect size of 0.30. Post-hoc comparisons indicated that the mean BSE was significantly different among all three groups. The highest BSE was seen in participants with no problems and the lowest BSE was in participants with "some" to "a lot" of problems. At T2, there was also a statistically significant difference in BSE scores among the three groups: F (2, 96) = 40.00, $p < .001$ with a large effect size of 0.45. Post-hoc comparisons indicated that participants with the most problems scored significantly lower in BSE than participants with only a few problems and those with no problems.

Table 9 presents one-way between-groups analyses of variance comparing the mean BSE among groups based on the amount of personal assistance needed to overcome breastfeeding problems reported by participants at T1 and T2. There was no statistical significance among mean BSE in participants reporting little or no assistance needed, those reporting some assistance, and for those needing a lot of assistance in either the early or later postpartum period.

Table 10 presents one-way between-groups analyses of variance comparing the mean BSE among groups based on participants' perception of the quantity of assistive devices they needed to treat their breastfeeding problems at T1 and again at T2. There was no statistical significance among mean BSE in participants reporting they needed none, some, or a lot of devices either at T1 or T2. Table 10 also presents one-way between-groups analyses of variance comparing mean BSE in participants who reported using 0-2 devices, 3-5 devices, and 6 or more

devices at T1 and T2. At T1, there was no significance in mean BSE among the three device-use groups. However, there was a statistically significant difference in BSE scores for the three device-use groups: F (2, 97) = 10.53, $p < .001$ with a large effect size of 0.18 in the participants reporting device usage at T2. Participants who used 6 or more devices had significantly lower mean BSE scores that those who used 3-5 or 0-2 devices.

Data were obtained from open-ended questions requesting additional information or comments beyond the available answer choices. Responses supported and extended the numeric data. For example, participants described the context in which they used certain devices to maintain and extend the provision of human milk to their infants. Respondents also recounted experiences of receiving helpful assistance from nurses, IBCLCs, and family members.

Discussion

The findings of this study offer insight into sources affecting maternal confidence in breastfeeding skills during the early postpartum period. In the first few days of breastfeeding, participants who attributed breastfeeding problems to an even split between maternal and newborn origins or a maternal source had lower BSE than those who attributed problems to the infant or reported no problems. At 2-3 weeks postpartum, a pattern of lower BSE persisted in participants who perceived problems originating from themselves or with an even split between maternal and newborn sources. Low milk supply, engorgement, and nipple pain are common breastfeeding problems of a maternal origin in the early weeks of breastfeeding (Feenstra et al., 2018; Francis et al., 2018; Jackson & Dennis, 2017; Wagner et al., 2013). Maternal physical or affective state including fear of pain and subsequent stress response during the time surrounding the feeding can lower BSE (Niwayama et al., 2017) and contribute to decreased breastfeeding exclusivity at 3 months (Shiraishi et al., 2020).

In this study there was no statistically significant relationship between BSE and the perceived level of personal assistance needed to overcome breastfeeding problems. This is contrary to the findings of Zhu et al. (2017) who noted increased confidence in breastfeeding skills at 3 days postpartum following personal instruction. The majority of BSE intervention studies have included a prenatal educational component that varied in length and have demonstrated improved mean postnatal BSE scores (Piro & Ahmed, 2020; Shafaei et al., 2020) and a reduction in the frequency of early postpartum breastfeeding problems (Shafaei et al., 2020). Although perceived need for assistance did not significantly alter BSE, several participants commented on specific instances when they received help. One participant stated, "Within one hour after delivery the nurses assisted me with latching my baby and getting us both comfortable with breastfeeding." Another participant noted inconsistency in maintaining personal assistance and guidance, "Lactation support in the hospital was very instructive and supportive, however getting a follow up appointment was difficult [not available for over 1 week]." When participants were asked about sources of problems external to maternal or infant sources, 40.3% (n = 50) listed lack of knowledge. Among women with a low mean BSE score at the time of the initial survey (n = 66), 76% (n = 38) reported having a lack of knowledge about breastfeeding. Self-efficacy has been recognized as a modifiable factor in intervention studies leading to sustained intention and perseverance with breastfeeding behaviors in the postpartum period (Bandura, 1977; Otsuka et al., 2014; Shiraishi et al., 2020; Wu et al., 2014; Chan et al., 2016). However, further research initiatives are needed to examine the relationship between BSE and the various components and timing of interventions introduced by nurses or lactation professionals to address BSE and feeding challenges.

One study was found that identified a cut off score of 50 to differentiate high and low scores for the BSES-SF (Nanishi et al., 2015). The mean BSES-SF score for this sample was 49.22 (*SD* = 10.72). In this study, maternal perception of problem intensity was significantly related to BSE. The 12 women who reported "a lot" or "a tremendous amount" of breastfeeding problems had a strikingly low group mean BSES-SF score (27.25) by 2-3 weeks postpartum. The 16 participants who reported no problems at 2-3 weeks postpartum had a high overall BSES-SF group mean score (61.38). Of 24 participants who reported no problems at the initial survey, 11 women developed "some problems" and 1 reported "a lot of problems" by the time of the second survey. The present study suggests that nurses and IBCLCs can screen for women who may benefit from interventions to improve BSE by asking individuals in early postpartum if they feel they have a significant quantity of breastfeeding problems. Assessing for the perceived amount of problems at the time of postpartum hospital discharge can identify women in need of planned follow up lactation care.

There was not a statistically significant relationship between BSE and the perception of needing to use none, some, or a lot of devices to treat breastfeeding problems at either the time of the initial survey or at follow up. However, at 2-3 weeks postpartum there was a trend toward those participants with low BSES-SF score means perceiving that they needed to use a lot of techniques and devices to treat and manage breastfeeding problems. In this study, participants could select techniques and devices they were using from a list of 16 common implements to alleviate breastfeeding problems or promote increased milk supply. Actual device use ranged from 0-12 devices (*M* = 4.22, *SD* = 2.8). In the first few days of breastfeeding, oils or ointments was the most common items selected by 74 participants (*n* = 121). Sixty-seven participants were using an electric breast pump, 60 participants were using a manual pump, and 55 mothers were

using bottles to deliver infant feedings. By 2-3 weeks postpartum, the most common device was an electric breast pump selected by 85 participants (n = 101), oils or ointments selected by 80 participants, bottles used by 73 participants, and a manual breast pump selected by 48 participants. One participant wanted more treatment options to control maternal nipple pain stating, "I believe there is very limited treatment for nipple trauma. Even properly latched babies do cause nipple trauma so more research on causes and efficiently treating nipple trauma is necessary for continuous breastfeeding." However, another participant expressed how weaning from a device increased her BSE and stated, "At first, I felt guilty for relying on the nipple shield, but lactation experts have relieved that. We've even had a few minutes exclusively on the nipple without the shield, which increases my confidence even more."

Techniques and devices to facilitate breastfeeding multiply quickly amidst challenges. The following participant comment highlights this phenomenon:

> "I use nipple shields to assist baby with latching as my nipples are flat and she would latch on very shallow causing me lots of pain & her to not have enough milk. She is feeding almost exclusively at the breast, though she sometimes takes some of my expressed milk from a bottle."

In this study, there was no statistically significant relationship between actual device use and BSE until 2-3 weeks postpartum. At this point, there was a significant drop in mean BSES-SF scores when participants were using six or more devices. Of the 36 participants who were initially using few (0-2) devices, 72.2% (n = 26) increased to three or more devices at the time of the follow up. Participants were also slow to wean from devices they began using in the first days of breastfeeding. All participants who were initially using three to five devices either continued this pattern or increased to six or more devices.

Few women commented on the presence of a written and well-communicated breastfeeding plan of care detailing interventions for problems in the first few weeks postpartum with one participant lamenting, “I wished they would write down the advice they give and offer videos of what they're demonstrating. So often you're exhausted and overwhelmed with information.” Gollwitzer (1999) referred to this nursing plan of care as *implementation intention*, prescribing when and how to perform the behavior. Aligning with the TPB, Ajzen (2006) recognized that implementation intention should bolster actual behavioral control and improve the possibility of mastery behavior. This aligns with assumptions of self-efficacy theories (Bandura, 1977; Dennis, 1999) that cognitive processes can lead to real behavior change and that repeated effective performance of a behavior helps perpetuate behaviors.

Prior breastfeeding accomplishment is an antecedent to self-efficacy in BSE theory (Dennis, 1999) with higher self-efficacy noted in multiparous women (Gerçek et al., 2016; Glassman et al., 2014; Hinic, 2016; Shiraishi et al., 2020; Yang et al., 2016). The same pattern was noted in this study. Individuals with no prior breastfeeding experience (n = 60) had lower mean BSES-SF scores (M = 46.07, SD = 9.94) than the 41 individuals who had breastfed one previous child (M = 52.07, SD = 9.50) and the 23 participants who had breastfed two or more children (M = 53.48, SD = 11.22). First-time mothers are more likely than women with multiple children to report problems in the early postpartum period, to supplement with a human milk substitute by the time of hospital discharge, and to initiate use of a breast pump within the few days following birth (Hackman et al., 2015; Loewenberg Weisband et al., 2017).

Previous studies have shown predictability of breastfeeding intentions and duration based on various concepts within the TPB and BSE theories (de Jager et al., 2013; Guo et al., 2016; Johnson-Young, 2019; Lau et al., 2018). Most notably, higher BSE scores at 1 month

postpartum are significantly associated with exclusive breastfeeding at 3 months, especially for primiparas (Shiraishi et al., 2020). De Roza et al. (2019) noted that a BSES-SF score over 50 and intention to breastfeed for at least 6 months predicted exclusive breastfeeding at 6 months. In this study, 71.7 % (n = 86) of participants reported exclusive breastfeeding at the time they completed the initial survey in the first postpartum week. Sixty percent (n = 72) indicated they had intentions to continue providing exclusive human milk at 1 month postpartum.

Limitations

Self-report through survey design research has the possibility of social desirability response bias, especially around the topic of breastfeeding (Polit & Beck, 2017; Waltz et al., 2017). Like other positive health behaviors, there is a tendency in breastfeeding research for participants to respond with answers they feel are expected and desired. Social desirability bias was minimized in this study by assuring participants that their responses were anonymous and were not linked to the provision of any services such as WIC or their medical care. Responses in open text boxes confirmed a willingness to express a variety of opinions about breastfeeding, with some in opposition to the dominate culture of human milk feeding as the norm. Additionally, devices, terminology such as “breastfeeding problems”, and infant feeding patterns over the last 24 hours were not defined for participants. Therefore, item selection was based on participant perceptions rather than defined parameters and could have been influenced by a low BSE.

The observational nature of this study design with no manipulation of variables and no randomization of samples has the disadvantage of being unable to show causality (Polit & Beck, 2017). Additionally, participants entering the study with an existing low BSE could have been poised to view their feeding difficulties as more extensive and their situation as needing

additional assistance from a healthcare professional. There is also a possibility that participants with less confidence in their skills for breastfeeding could have initiated or requested more tools and devices as a mechanism to address problems. Reverse causality and the influence of confounders has recently been explored in other health-related research such as cardiovascular, obesity, and depression studies (Banack et al., 2019; Jacka et al., 2015; Sattar & Preiss, 2017). Further investigation is warranted to explore the direction of correlation pathways in the current cohort.

The BSES-SF has multiple reliable and valid translations, but funding for translation resources was limited. Data from only English-speaking racial and ethnic groups limits generalizability. Although exclusion criteria included maternal physical health complications and unexpected surgery, some new mothers may have elected not to participate due to exhaustion or multiple competing surveys and tasks as part of the inpatient education and discharge process.

This study was conducted during the COVID-19 pandemic. In a systematic review of 49 international studies of the effects of disasters on perinatal health, severity of exposure was listed as the strongest predictor of maternal mental health disorders (Ren et al., 2014). Although little is known about the psychological impact of a slower onset and sustained societal disruption from the current COVID-19 crisis, reported stress levels during the pandemic are higher than average annual ratings in the United States, particularly for families with children, (American Psychological Association, 2020). At the outset of the study, little was known about the psychological impact the pandemic had on pregnant and postpartum women. A series of researcher-developed questions with a Likert-like response format assessed stress, anxiety, depression, and changes in the pregnancy, birth, and breastfeeding experience attributed to COVID-19. At T1, 94.4% (n = 118) of participants responded to the voluntary COVID-19

screening questions. Although 22.4% (*n* = 28) of participants reported “a lot” or “a tremendous amount” of stress and anxiety during pregnancy attributed to the pandemic, only 2.4% (*n* = 3) reported a lot of stress and anxiety with breastfeeding with an equal amount (*n* = 3) reporting that their breastfeeding experience had changed related to COVID-19. Although no participants were excluded from the study due to significant stress attributed to the pandemic, further studies are needed to explore correlations between changes in pregnancy and birth related to COVID-19 and breastfeeding patterns.

Conclusions

If the U.S. is to make strides in increasing the number of women who breastfeed from 25.6% to 42.4% exclusively breastfeeding at 6 months and 35.3% to 54.1% feeding any human milk at one year to achieve Healthy People 2030 goals (CDC, 2020a; Office of Disease Prevention and Health Promotion, 2020), new strategies and assistance to overcome breastfeeding challenges are needed. Screening for low BSE could prompt nurses and lactation staff to provide additional consultation and support to women at risk for breastfeeding cessation due to low confidence. This study highlights early postpartum as an essential time to promote interventions to improve BSE, especially for breastfeeding problems when an individual feels they are struggling between both problems of a maternal origin and a newborn origin. Improved BSE consistently leads to an increase in breastfeeding duration and exclusivity rates.

Collecting data within the first week of breastfeeding and again at 2-3 weeks postpartum provided an opportunity to receive feedback about any new patterns of breastfeeding behavior and feeding intentions during the time of transition from colostrum to mature milk. The lowest mean BSE scores were noted in women who reported a lot of breastfeeding problems, and only modest improvements in BSE were noted by the time of the follow up survey. A decrease in

BSE from initial to follow up survey was noted in women who were using six or more techniques and devices to overcome breastfeeding challenges. This study affirms the need for individualized assessment and interventions to improve confidence in the skills to breastfeed in women experiencing breastfeeding problems as the treatment plan becomes more complex during early postpartum.

Table 6

Descriptive Characteristics of Participants (N = 123)

Characteristics	*n*	%
Maternal age		
18-25	27	22.0
26-29	30	24.4
30-35	49	39.8
36-43	17	13.8
Education [a]		
Less than high school	2	1.6
High school	16	13.1
Some college	27	22.1
Associate degree	18	14.8
Bachelor's degree	45	36.9
Post-bachelor	14	11.5
Race/Ethnicity [a]		
White	80	65.6
African American	26	21.3
Latina	6	4.9
Asian	3	2.5
Other/Mixed	7	5.7
Health insurance coverage [a]		
Private insurance	86	70.5
Medicaid	34	27.9
Other	2	1.6
Type of birth [a]		
Vaginal without epidural	25	20.5
Vaginal with epidural	56	45.9
Planned cesarean	20	17.2
Unexpected cesarean	21	16.4
Breastfeeding experience [a]		
First experience	60	49.2
Previously breastfed one other child	40	32.8
Previously breastfed two or more children	22	18.0
Source of breastfeeding education [a]		
Prenatal class	23	18.9
Online information	26	21.3
Family member	10	8.2
Friends	10	8.2
Health care provider	53	43.4

[a] Missing (n = 1)

Table 7

Means, Standard Deviations, and One-Way Analyses of Variance on Breast Feeding Self-Efficacy as a Function of Source of BF Problem at T1(N = 123) and T2 (N = 97)

Source of Problem	*n*	*M*	*SD*	*F*	*p*	η^2
BF Source at T1				11.94	<.001	.231
Baby	25	51.16_{a}	9.50			
Even split	31	43.06_{b}	9.16			
Mostly mom	44	$47.32_{a,b}$	10.49			
None	23	$58.04_{a,b,c}$	7.54			
BF Source at T2				5.89	.001	.160
Baby	16	54.19_{a}	11.37			
Even split	36	48.03_{b}	13.67			
Mostly mom	30	$47.50_{a,b}$	12.71			
None	15	$61.80_{a,c}$	6.01			

Note. Means sharing a common subscript are not significantly different from each other.

Table 8

Means, Standard Deviations, and One-Way Analyses of Variance on Breast Feeding Self-Efficacy as a Function of Mother's Perception of the Intensity of BF Problems at T1 (N = 123) and T2 (N = 99)

Intensity of Problem	*n*	*M*	*SD*	*F*	*p*	η^2
BF Intensity at T1				25.89	<.001	.301
None	30	57.63_a	7.00			
Few	54	49.39_b	8.69			
Some-a lot	39	41.95_c	10.60			
BF Intensity at T2				40.00	<.001	.455
None	16	61.38_a	6.05			
Few	48	56.21_a	8.05			
Some-a lot	35	39.66_b	12.64			

Note. Means sharing a common subscript are not significantly different from each other.

Table 9

Means, Standard Deviations, and One-Way Analyses of Variance on Breast Feeding Self-Efficacy as a Function of Mother's Perception of Personal Assistance Needed to Overcome BF Problems at T1 (N = 122) and T2 (N = 99)

Personal assistance	*n*	*M*	*SD*	*F*	*p*	η^2
Personal assistance at T1				1.05	.355	.017
None-little	15	51.53	11.47			
Some	43	47.30	10.88			
A lot	64	49.95	10.39			
Personal assistance at T2				2.56	.082	.051
None-little	27	53.81	14.97			
Some	41	47.43	11.82			
A lot	31	53.48	11.93			

Table 10

Means, Standard Deviations, and One-Way Analyses of Variance on Breast Feeding Self-Efficacy as a Function of Mother's Perception of Quantity of Assistive Devices and Actual Devices Needed to Treat BF Problems and at T1 (N = 121) and T2 (N = 99)

Assistive devices	*n*	*M*	*SD*	*F*	*p*	η^2
Perceived device quantity at T1				3.02	.052	.049
None	21	53.52	7.26			
Some	85	48.61	10.83			
A lot	15	45.07	12.71			
Perceived device quantity at T2				1.63	.202	.033
None	4	54.75	3.77			
Some	78	52.10	11.62			
A lot	17	46.18	18.67			
Actual devices used at T1				0.83	.439	.014
0-2	42	50.71	8.92			
3-5	42	48.43	10.83			
6+	37	47.78	12.46			
Actual devices used at T2				10.53	<.001	.176
0-2	12	60.67_a	7.47			
3.5	47	54.36_a	9.78			
6+	41	45.23_b	14.87			

Note. Means sharing a common subscript are not significantly different from each other.

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APPENDIX A: NOTIFICATION OF UMCIRB APPROVALS

EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board
4N-64 Brody Medical Sciences Building· Mail Stop 682
600 Moye Boulevard · Greenville, NC 27834
Office **252-744-2914** · Fax **252-744-2284** ·
www.ecu.edu/ORIC/irb

Notification of Initial Approval: Expedited

From: Social/Behavioral IRB
To: Lori Hubbard
CC: Pamela Reis
Date: 1/15/2019
Re: UMCIRB 18-002416
Beliefs and decision-making of first-time mothers planning to use a breast pump

I am pleased to inform you that your Expedited Application was approved. Approval of the study and any consent form(s) is for the period of 1/14/2019 to 1/13/2020. The research study is eligible for review under expedited category #6, 7. The Chairperson (or designee) deemed this study no more than minimal risk.

Changes to this approved research may not be initiated without UMCIRB review except when necessary to eliminate an apparent immediate hazard to the participant. All unanticipated problems involving risks to participants and others must be promptly reported to the UMCIRB. The investigator must submit a continuing review/closure application to the UMCIRB prior to the date of study expiration. The Investigator must adhere to all reporting requirements for this study.

Approved consent documents with the IRB approval date stamped on the document should be used to consent participants (consent documents with the IRB approval date stamp are found under the Documents tab in the study workspace).

The approval includes the following items:

Name	Description
consent form	Consent Forms
demographic questions	Surveys and Questionnaires
demographic questions	Data Collection Sheet
interview guide	Interview/Focus Group Scripts/Questions
Protocol	Study Protocol or Grant Application
recruitment script	Recruitment Documents/Scripts

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board
4N-64 Brody Medical Sciences Building· Mail Stop 682
600 Moye Boulevard · Greenville, NC 27834
Office **252-744-2914** · Fax **252-744-2284** ·
rede.ecu.edu/umcirb/

Notification of Initial Approval: Expedited

From: Biomedical IRB
To: Lori Hubbard
CC: Pamela Reis
Date: 4/2/2020
Re: UMCIRB 19-002974
Breastfeeding Self-Efficacy in Women Using Assistive Techniques and Devices to Address Maternal and Infant Feeding Problems

I am pleased to inform you that your Expedited Application was approved. Approval of the study and any consent form(s) occurred on 4/1/2020. The research study is eligible for review under expedited category # 7. The Chairperson (or designee) deemed this study no more than minimal risk.

Changes to this approved research may not be initiated without UMCIRB review except when necessary to eliminate an apparent immediate hazard to the participant. All unanticipated problems involving risks to participants and others must be promptly reported to the UMCIRB. The investigator must submit a Final Report application to the UMCIRB prior to the Expected End Date provided in the IRB application. If the study is not completed by this date, an Amendment will need to be submitted to extend the Expected End Date. The Investigator must adhere to all reporting requirements for this study.

Approved consent documents with the IRB approval date stamped on the document should be used to consent participants (consent documents with the IRB approval date stamp are found under the Documents tab in the study workspace).

The approval includes the following items:

Name	Description
Breastfeeding Self-Efficacy Scale - Short Form	Surveys and Questionnaires
BSE Research Protocol	Study Protocol or Grant Application
BSE Study Researcher-Designed Survey Questions	Surveys and Questionnaires
Consent Letter for Expedited Survey Research	Consent Forms
Dissertation Proposal	Study Protocol or Grant Application
Lactation Consultant training module	Additional Items
Recruitment Flyer	Recruitment Documents/Scripts
Recruitment Script	Recruitment Documents/Scripts
Reminder email	Recruitment Documents/Scripts

For research studies where a waiver of HIPAA Authorization has been approved, each of the waiver criteria in 45 CFR 164.512(i)(2)(ii) has been met. Additionally, the elements of PHI to be collected as described in items 1 and 2 of the Application for Waiver of Authorization have been determined to be the minimal necessary for the specified research.

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

APPENDIX B: CONE HEALTH IRB AUTHORIZATION AGREEMENTS

Institutional Review Board (IRB) Authorization Agreement

Name of Institution or Organization Providing IRB Review (Institution/Organization A):
East Carolina University

IRB Registration #: IRB00000705 **Federalwide Assurance (FWA) #, if any:** FWA00000658

Name of Institution Relying on the Designated IRB (Institution B):
Cone Health

FWA #: FWA00004507

The Officials signing below agree that ____*(name of Institution B)*____ may rely on the designated IRB for review and continuing oversight of its human subjects research described below: (*check one*)

(___) This agreement applies to all human subjects research covered by Institution B's FWA.

(_X_) This agreement is limited to the following specific protocol(s):

Name of Research Project: Beliefs and Decision-Making of First-Time Mothers Planning to Use a Breast Pump (UMCIRB# 18-002416)
Name of Principal Investigator (*institution A*): Lori Hubbard
Name of Investigator (*institution B*): _____
Sponsor or Funding Agency: N/A Award Number, if any: N/A

(___) Other (*describe*):_____

The review performed by the designated IRB will meet the human subject protection requirements of Institution B's OHRP-approved FWA. The IRB at Institution/Organization A will follow written procedures for reporting its findings and actions to appropriate officials at Institution B. Relevant minutes of IRB meetings will be made available to Institution B upon request. Institution B remains responsible for ensuring compliance with the IRB's determinations and with the Terms of its OHRP-approved FWA. This document must be kept on file by both parties and provided to OHRP upon request.

Signature of Signatory Official (Institution/Organization A):
_____ Date: _____

Print Full Name: Michael R. Van Scott, PhD
Institutional Title: Senior Associate Vice Chancellor for Research and Institutional Official
Phone: (252)328-9479 Email: vanscottmi@ecu.edu

Signature of Signatory Official (Institution B):
_____ Date: 2/1/19

Print Full Name: Dereck DeLeon, MD
Institutional Title: Chief Academic Officer and Institutional Office
Phone: (336) 832-5594 Email: dereck.deleon@conehealth.com

Version Date: 5/31/12

Institutional Review Board (IRB) Authorization Agreement

Name of Institution or Organization Providing IRB Review (Institution/Organization A):
East Carolina University, University and Medical Center Institutional Review Board (UMCIRB)

IRB Registration #: 00000705 Federalwide Assurance (FWA) #, if any: 00000658

Name of Institution Relying on the Designated IRB (Institution B):
The Moses H. Cone Memorial Hospital Operating Corporation **FWA #: FWA00004507**

The Officials signing below agree that The Moses H. Cone Memorial Hospital Operating Corporation may rely on the designated IRB for review and continuing oversight of its human subjects research described below: (*check one*)

(___) This agreement applies to all human subjects research covered by Institution B's FWA.

(X) This agreement is limited to the following specific protocol(s):

Name of Research Project: Breastfeeding Self-Efficacy in Women Using Assistive Techniques and Devices to Address Maternal and Infant Feeding Problems (UMCIRB# 19-002974)
Name of Principal Investigator (*institution A*): Lori Hubbard (Student at ECU)
Name of Investigator (*institution B*): Lori Hubbard (Employee at Cone Health)
Sponsor or Funding Agency: N/A Award Number, if any: _____

(___) Other (*describe*):_____

The review performed by the designated IRB will meet the human subject protection requirements of Institution B's OHRP-approved FWA. The IRB at Institution/Organization A will follow written procedures for reporting its findings and actions to appropriate officials at Institution B. Relevant minutes of IRB meetings will be made available to Institution B upon request. Institution B remains responsible for ensuring compliance with the IRB's determinations and with the Terms of its OHRP-approved FWA. This document must be kept on file by both parties and provided to OHRP upon request.

Signature of Signatory Official (Institution/Organization A):

_____ Date: _____

Print Full Name: Mary Farwell, Ph.D. Institutional Title: Assistant Vice Chancellor for Research, Economic Development, and Engagement
Phone: (252)328-9476 Email: farwellm@ecu.edu

Signature of Signatory Official (Institution B):

_____ Date: 3/27/2020

Print Full Name: Derek Deleon, MD
Institutional Title: Chief Academic Officer
Phone: 336-832-5594 Email: derek.deleon@conehealth.com

APPENDIX C: CONSENT LETTERS FOR EXPEDITED SURVEY RESEARCH

Informed Consent to Participate in Research

Information to consider before taking part in research that has no more than minimal risk.

Title of Research Study: Beliefs and decision-making of first-time mothers planning to use a breast pump

Principal Investigator: Lori Hubbard RN, MSN, IBCLC (Person in Charge of this Study)
Institution, Department or Division: East Carolina University, College of Nursing
Address: 2205 W 5th St, Greenville, NC 27889
Telephone #: (336) 269-1458 (mobile)

Researchers at East Carolina University (ECU) and Cone Health study issues related to society, health problems, environmental problems, behavior problems and the human condition. To do this, we need the help of volunteers who are willing to take part in research.

Why am I being invited to take part in this research?
The purpose of this research is to learn more about how and when new mothers make decisions about using a breast pump and where they receive information about breast pumps. You are being invited to take part in this research because you are a first-time mother with a heathy baby and have indicated that you are going to provide breast milk for some or all feedings. The decision to take part in this research is yours to make. By doing this research, we hope to learn how to educate and support first-time mothers so they can meet their breastfeeding goals.

If you volunteer to take part in this research, you will be one of about eight people to do so.

Are there reasons I should not take part in this research?
I understand I should not volunteer for this study if I am under 18 years of age, if I do not plan to provide breastmilk to my baby, or if my baby is in the Special Care Nursery.

What other choices do I have if I do not take part in this research?

You can choose not to participate, and your decision to not participate in this study will in no way affect the care you or your infant receive.

Where is the research going to take place and how long will it last?

The research will be conducted at Cone Health Alamance Regional Medical Center in Burlington, NC in the Women's Care Center postpartum unit. The total amount of time you will be asked to volunteer for this study is an hour or less today.

What will I be asked to do?

You will be asked to do the following: Answer basic questions about yourself and your pregnancy and then discuss your thoughts about using a breast pump as you answer an additional eight to ten question at

a time today when you have approximately an hour of available time. The interview will be audio taped with the digital files de-identified and stored on a secure network only accessible to the researcher and research team. You can stop the interview at any time or decide not to participate.

What might I experience if I take part in the research?
We don't know of any risks (the chance of harm) associated with this research. Any risks that may occur with this research are no more than what you would experience in a typical conversation. We don't know if you will benefit from taking part in this study. There may not be any personal benefit to you, however the information gained by doing this research may help others in the future.

Will I be paid for taking part in this research?
We will be able to pay you for the time you volunteer while being in this study. You will be given a $10 department store gift card today by volunteering to participate.

Will it cost me to take part in this research?
It will not cost you any money to be part of the research.

Who will know that I took part in this research and learn personal information about me?
ECU and the people and organizations listed below may know that you took part in this research and may see information about you that is normally kept private such as the weight of your baby and educational background. With your permission, these people may use your private information to do this research:

- Any agency of the federal, state, or local government that regulates human research. This includes the Department of Health and Human Services (DHHS), the North Carolina Department of Health, and the Office for Human Research Protections.
- The University & Medical Center Institutional Review Board (UMCIRB) and its staff have responsibility for overseeing your welfare during this research and may need to see research records that identify you.

How will you keep the information you collect about me secure? How long will you keep it?
You will be assigned a code number. This code number will identify your answers on the computer and paper files. Recorded audio tapes of your answers will be erased after they are transferred to a secure computer network. Consent forms and any paper forms will be stored in a locked file cabinet behind a locked door in the Research Office at the East Carolina University College of Nursing and digital files stored on East Carolina password protected computers. The research team will have access to the data. Only the Associate Dean of Research and Scholarship and Administrative Assistant will have keys to access the file cabinet. Your information will be kept for six years and then will be deleted. We may choose to talk about this information at a nursing meeting or publish the results of the study in a nursing magazine. This will help other nurses know how to provide better care. Your name will not be used. We will keep your information and answers secret and confidential unless we are required by a court or law enforcement agency to give them the information.

What if I decide I don't want to continue in this research?
You can stop at any time after it has already started. There will be no consequences if you stop and you will not be criticized. You will not lose any benefits that you normally receive, and the care that you and your infant receive will not be affected.

Who should I contact if I have questions?

The people conducting this study will be able to answer any questions concerning this research, now or in the future. You may contact the Principal Investigator at (336) 269-1458 Monday through Friday between 9am and 5pm.

If you have questions about your rights as someone taking part in research, you may call the Office of Research Integrity & Compliance (ORIC) at phone number 252-744-2914 (days, 8:00 am-5:00 pm). If you would like to report a complaint or concern about this research study, you may call the Director of the ORIC, at 252-744-1971.

Is there anything else I should know?

Most people outside the research team will not see your name on your research record. This includes people who try to get your information using a court order. One exception is information about child abuse or neglect and harm to yourself or others.

This plan has been reviewed by the University & Medical Center Institutional Review Board and found to be adequate to protect your rights.

I have decided I want to take part in this research. What should I do now?

The person obtaining informed consent will ask you to read the following and if you agree, you should sign this form:

- I have read (or had read to me) all of the above information.
- I have had an opportunity to ask questions about things in this research I did not understand and have received satisfactory answers.
- I know that I can stop taking part in this study at any time.
- By signing this informed consent form, I am not giving up any of my rights.
- I have been given a copy of this consent document, and it is mine to keep.

_____ _____ _____

Participant's Name (PRINT) **Signature** **Date**

Person Obtaining Informed Consent: I have conducted the initial informed consent process. I have orally reviewed the contents of the consent document with the person who has signed above, and answered all of the person's questions about the research.

_____ _____ _____

Person Obtaining Consent (PRINT) **Signature** **Date**

Dear Participant,

I am a PhD student at East Carolina University in the College of Nursing. I am asking you to take part in my research study entitled, "Breastfeeding Self-Efficacy in Women Using Assistive Techniques and Devices to Address Maternal and Infant Feeding Problems".

The purpose of this research is to learn more about the level of confidence new mothers have in their ability to breastfeed, what they perceive as problems with breastfeeding in the first few weeks after the baby is born, and how techniques and devices to manage breastfeeding problems impact current and future plans for infant feeding. By doing this research, I hope to learn how to educate and support mothers so they can meet their breastfeeding goals. Your participation is completely voluntary.

You are being invited to take part in this research you are a mother with a heathy baby and have indicated that you are going to provide breast milk for some or all feedings. The amount of time it will take you to complete this survey is approximately 10 minutes when your baby is 1-3 days old. A reminder email will be sent to you to complete this survey again when your baby is two weeks old.

If you agree to take part in this survey, you will be asked questions about yourself, your breastfeeding experiences since birth, and your plans for infant feeding during your baby's first year of life. The first 150 potential participants will receive a magnetic frame for interest in the first survey. After completing the second survey, the first 124 participants will have an opportunity to win 1 of 4 $25 Visa gift cards. An additional drawing to win 1 of 4 $25 Visa gift cards will be held at the end of the study. Winners will be selected randomly and notified via email.

This research is overseen by the University and Medical Center Institutional Review Board (UMCIRB) at ECU. Therefore, some of the UMCIRB members or the UMCIRB staff may need to review your research data. You will be assigned a participant number and asked to provide an email address so a second survey can be sent to you. Your participant number and email address will be linked for up to six months in a secure online database until participant numbers are randomly drawn to receive prizes and winners notified by email. At that time, your email will be deleted. Only participant numbers and survey responses will be transferred to data analysis software on a secure, password-protected ECU network. Therefore, your responses cannot be traced back to you by anyone, including me. Your information collected as part of the research, even if identifiers are removed, will not be used or distributed for future studies.

Please call Lori Hubbard at (336) 269-1458 or hubbardl17@students.ecu.edu for any research related questions. If you have questions about your rights when taking part in this research, call the University and Medical Center Institutional Review Board (UMCIRB) at 252-744-2914 (days, 8:00 am-5:00 pm). If you would like to report a complaint or concern about this research study, call the Director of Human Research Protections, at 252-744-2914

You do not have to take part in this research, and you can stop at any time. If you have questions about infant feeding, contact lactation services at the hospital or your health care provider. If you decide you are willing to take part in this study, continue with the survey below.

Thank you for taking the time to participate in my research.

Sincerely,
Lori Hubbard, Principal Investigator

APPENDIX D: REMINDER EMAIL

Email Subject: Brief follow up survey about breastfeeding

Thank you for answering questions about your breastfeeding experiences when your baby was a few days old. Even if you are no longer giving your baby breast milk, your answers to these follow-up questions will help us understand how new mothers work through issues in the first few weeks of infant feeding. Your participation is voluntary but greatly appreciated. All answers will be kept confidential.

After completing the survey, you will have an opportunity to win 1 of 4 $25 Visa gift cards. Winners will be selected randomly and notified via email.

You may open the survey in your web browser by clicking the link below:
[Link]

If the link above does not work, try copying the link below into your web browser:
[Link]

If you have questions about your rights as someone taking part in research, you may call the ECU University & Medical Center Institutional Review Board (UMCIRB) at phone number 252-744-2914 (Monday-Friday, 8:00 am-5:00 pm). If you would like to report a concern about this research study, you may call the Director for Human Research Protections, at 252-744-2914. If you would like to reach me, please contact me at hubbardl17@students.ecu.edu

If you have questions about infant feeding, contact lactation services at the hospital or your health care provider.

With many thanks!

Lori Hubbard, Doctoral Student

East Carolina University College of Nursing

APPENDIX E: RESEARCHER-DESIGNED SURVEY QUESTIONS

- If completing this survey for the first time, the survey flows to the Introduction including consent and ID assignment.
- If answering the questions again at 2 weeks postpartum, the inclusion criteria verification and demographics sections are omitted, and the survey begins at the BSES-SF

INTRODUCTION:

I have read the information provided in the Consent Form introduction inviting me to participate in this study. I have asked all the questions I have at this time. I voluntarily agree to participate in this research study

- Yes
- No

Provide your email to receive a follow up survey in two weeks. Completing the follow up survey will enter you in a drawing for one of four $25 Visa gift cards. [text entry]

INCLUSION CRITERIA VERIFICATION:

Please answer the following general questions:

How many weeks pregnant were you at the time of the birth of this child?

- Less than 37 weeks (Survey ends with a thank you and indication that inclusion criteria are not met)
- 37 weeks to 38 weeks & 6 days
- 39 weeks to 40 weeks & 6 days
- 41 weeks to 41 weeks & 6 days
- 42 weeks or over

Has your newborn experienced any major health complications or been admitted to the Neonatal Intensive Care Unit/Special Care Nursery since birth?

- No
- Yes (Survey ends with a thank you and indication that inclusion criteria are not met)

DEMOGRAPHICS ("GENERAL QUESTIONS"):

Where did you give birth to your baby?

- Cone Health Alamance Regional Medical Center (Burlington, NC)
- Cone Health Women's & Children's Center at Moses Cone Hospital (Greensboro, NC)

What is your age? (List as a whole number)

- [text entry]

Describe your amount of breastfeeding experience:
- Feeding this child is my first experience with breastfeeding
- I have breastfed one other child
- I have breastfed two or more children

What has been your primary source of education about breastfeeding:
- A prenatal breastfeeding class
- On-line information
- Family members
- Friends
- A health care provider

What type of birth did you experience with this child?
- Vaginal birth without epidural
- Vaginal birth with epidural
- Unexpected cesarean section
- Scheduled cesarean section

What is your highest level of education?
- Did not finish High School
- High School Diploma or GED
- Some College
- Associate's Degree (2-year degree)
- Bachelor's Degree (4-year degree)
- Graduate Degree (Masters, PhD, JD, MD, etc.)

How would you identify your race/ethnicity (check all that apply)?
- White
- Black or African American
- Latina
- Asian
- Native Hawaiian or Other Pacific Islander
- American Indian or Alaskan Native
- Other (Please specify): _____

What is your source of health insurance coverage?
- Private insurance
- Government-sponsored insurance (Medicaid)
- Tricare
- No coverage/Self-pay

BREASTFEEDING PROBLEMS:

How old is your baby? (List as number of days since birth)

- [Text entry]

When you think about any breastfeeding problems since the baby's birth, would you say you have had:

- No problems
- A few problems
- Some problems
- A lot of problems
- A tremendous amount of problems

When you think about any breastfeeding problems you have had, would you say the problems were:

- All with the baby
- Mostly with the baby and a little with me
- Evenly split between me and the baby
- Mostly with me and a little with the baby
- All with me
- Not from me or my baby but from another source
- I have not experienced any breastfeeding problems with this child

If you feel that the source of breastfeeding problems is not from you or your baby, would you say problems are from (Check any that apply): - YES/NO format

- Not enough knowledge about breastfeeding
- Pressure from my support person
- Pressure from family or friends
- Lack of support from my primary support person
- Lack of support from family or friends
- Pressure from healthcare professionals
- Lack of support from healthcare professionals
- Not applicable

If you had a problem not included in this list, describe it here.

- [Text entry]

ASSISTIVE TECHNIQUES AND DEVICES:

When you think about assistance you have received with breastfeeding, would you say you have had:

- No help
- A little bit of help
- Some help
- A lot of help
- A tremendous amount of help

From this list, who has helped you with breastfeeding since the birth of the baby (Check any that apply):

- A lactation consultant before leaving the hospital
- A nurse in the hospital
- A lactation consultant or nurse at my pediatrician's office
- My pediatrician
- My physician or midwife
- A friend
- A family member
- A breastfeeding peer counselor
- An in-person support group at the hospital
- An in-person support group in the community such as La Leche League
- An online breastfeeding support group
- No help

From this list, which breastfeeding techniques or devices have you used to help with breastfeeding problems (Check any that apply):

- Electric Breast pump
- Manual (hand-operated) breast pump
- Nipple shield
- Breast shells for inverted nipples
- Bottles
- Cup feeder
- Syringe or finger feeder
- Supplemental nursing system (SNS)
- Haakaa milk collector
- Cabbage leaves
- Hot or cold packs
- Breast shells for sore nipples
- Hydrogel pads
- Oils or ointments on your nipples for soreness
- Herbs, teas, foods, or medication to increase milk production
- Pre/post feeding weights
- No devices

If you used techniques or devices not included in this list, describe them here. You can also use this space to tell us more about your use of any of the devices or techniques in the list.

- [Text entry]

Thinking of the techniques and devices to assist with breastfeeding, do you feel you have used:

- No breastfeeding devices
- Very few breastfeeding devices
- Some breastfeeding devices
- A lot of breastfeeding devices
- A tremendous amount of breastfeeding devices

BREASTFEEDING BEHAVIOR & INTENTION:

In the past 24 hours, how would you describe your infant's feeding pattern?

- Exclusively at the breast
- Only my expressed breast milk but given with a bottle or other feeding device
- Donor breast milk given with a bottle or other feeding device
- Almost exclusively at the breast but with an occasional supplement of formula
- Mostly breastfeeding but with some formula feeding
- An even mix between breastfeeding and formula feeding
- Some breastfeeding but mostly formula feeding
- Exclusively formula feeding

You are almost finished with the survey!
For each newborn age listed below, indicate how you think you will be feeding either breast milk or formula to your baby. This does not include feeding solid foods, water, or other liquids.

1 month

- Exclusively at the breast
- Only my expressed breast milk but given with a bottle or other feeding device
- Donor breast milk given with a bottle or other feeding device
- Almost exclusively at the breast but with an occasional supplement of formula
- Mostly breastfeeding but with some formula feeding
- An even mix between breastfeeding and formula feeding
- Some breastfeeding but mostly formula feeding
- Exclusively formula feeding

3 months

- Exclusively at the breast
- Only my expressed breast milk but given with a bottle or other feeding device
- Donor breast milk given with a bottle or other feeding device
- Almost exclusively at the breast but with an occasional supplement of formula
- Mostly breastfeeding but with some formula feeding
- An even mix between breastfeeding and formula feeding
- Some breastfeeding but mostly formula feeding
- Exclusively formula feeding

6 months

- Exclusively at the breast
- Only my expressed breast milk but given with a bottle or other feeding device
- Donor breast milk given with a bottle or other feeding device
- Almost exclusively at the breast but with an occasional supplement of formula
- Mostly breastfeeding but with some formula feeding
- An even mix between breastfeeding and formula feeding
- Some breastfeeding but mostly formula feeding
- Exclusively formula feeding

9 months

- Exclusively at the breast

- Only my expressed breast milk but given with a bottle or other feeding device
- Donor breast milk given with a bottle or other feeding device
- Almost exclusively at the breast but with an occasional supplement of formula
- Mostly breastfeeding but with some formula feeding
- An even mix between breastfeeding and formula feeding
- Some breastfeeding but mostly formula feeding
- Exclusively formula feeding

1 year
- Exclusively at the breast
- Only my expressed breast milk but given with a bottle or other feeding device
- Donor breast milk given with a bottle or other feeding device
- Almost exclusively at the breast but with an occasional supplement of formula
- Mostly breastfeeding but with some formula feeding
- An even mix between breastfeeding and formula feeding
- Some breastfeeding but mostly formula feeding
- Exclusively formula feeding

Beyond 1 year
- Exclusively at the breast
- Only my expressed breast milk but given with a bottle or other feeding device
- Donor breast milk given with a bottle or other feeding device
- Almost exclusively at the breast but with an occasional supplement of formula
- Mostly breastfeeding but with some formula feeding
- An even mix between breastfeeding and formula feeding
- Some breastfeeding but mostly formula feeding
- Exclusively formula feeding

COMMENTS (Optional)
- Use the text box to further describe your experiences with breastfeeding, help you felt you needed or received, or devices used for problems with feeding. [Text entry]

COVID-19 QUESTIONS

Please provide additional comments if you would like to share more about your experiences with pregnancy, birth, and breastfeeding during the COVID-19 pandemic.

If you have a significant amount of stress, anxiety, or depression please contact your primary healthcare provider or visit Postpartum Support International at https://www.postpartum.net/learn-more/pregnancy-postpartum-mental-health/ for resources and a confidential helpline.

Did you feel extra stress or anxiety because you were pregnant or giving birth during the COVID-19 pandemic?
- None
- Not much
- Somewhat

- A lot
- A tremendous amount
- Comments (optional) [Text entry]

Did you feel extra stress or anxiety because you were breastfeeding during the COVID-19 pandemic?

- None
- Not much
- Somewhat
- A lot
- A tremendous amount
- Comments (optional) [Text entry]

Did you feel depressed because you were pregnant or giving birth during the COVID-19 pandemic?

- None
- Not much
- Somewhat
- A lot
- A tremendous amount
- Comments (optional) [Text entry]

Does the fact that you are breastfeeding during the COVID-19 pandemic make you feel depressed?

- None
- Not much
- Somewhat
- A lot
- A tremendous amount
- Comments (optional) [Text entry]

How much did COVID-19 change your pregnancy experience?

- None
- Not much
- Somewhat
- A lot
- A tremendous amount
- Comments (optional) [Text entry]

How much did COVID-19 change your birthing experience?

- None
- Not much
- Somewhat
- A lot
- A tremendous amount
- Comments (optional) [Text entry]

How much has COVID-19 changed your breastfeeding experience?

- None
- Not much
- Somewhat
- A lot
- A tremendous amount
- Comments (optional) [Text entry]

Is there anything else you would like to share about your experience of being pregnant, giving birth, and breastfeeding during the COVID-19 pandemic? (optional)

- [Text entry]

APPENDIX F: BSES-SF AUTHORIZATION EMAIL

Cindy-Lee Dennis <cindylee.dennis@utoronto.ca>

Wed 06/12/2019 04:23 PM

BSES-SF.DOC

45 KB

Dear Lori
Thank you for your email and interest in my Breastfeeding Self-Efficacy Scale. I have attached the short form that can be used in your study. Please let me know if you have any questions.
Warm regards
Cindy-Lee Dennis

Cindy-Lee Dennis, PhD, FCAHS
Professor in Nursing and Medicine, Dept. of Psychiatry, University of Toronto;
Women's Health Research Chair, Li Ka Shing Knowledge Institute, St. Michael's Hospital;
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APPENDIX G: BREASTFEEDING SELF-EFFICACY SCALE – SHORT FORM

Breastfeeding Self-Efficacy Scale – Short Form

For each of the following statements, please choose the answer that best describes how confident you are with breastfeeding your new baby. Please mark your answer by circling the number that is closest to how you feel. There is no right or wrong answer.

1 = not at all confident
2 = not very confident
3 = sometimes confident
4 = confident
5 = very confident

	Not at all Confident				**Very Confident**
I can always determine that my baby is getting enough milk	1	2	3	4	5
I can always successfully cope with breastfeeding like I have with other challenging tasks	1	2	3	4	5
I can always breastfeed my baby without using formula as a supplement	1	2	3	4	5
I can always ensure that my baby is properly latched on for the whole feeding	1	2	3	4	5
I can always manage the breastfeeding situation to my satisfaction	1	2	3	4	5
I can always manage to breastfeed even if my baby is crying	1	2	3	4	5
I can always keep wanting to breastfeed	1	2	3	4	5
I can always comfortably breastfeed with my family members present	1	2	3	4	5
I can always be satisfied with my breastfeeding experience	1	2	3	4	5
I can always deal with the fact that breastfeeding can be time consuming	1	2	3	4	5
I can always finish feeding my baby on one breast before switching to the other breast	1	2	3	4	5
I can always continue to breastfeed my baby for every feeding	1	2	3	4	5
I can always manage to keep up with my baby's breastfeeding demands	1	2	3	4	5
I can always tell when my baby is finished breastfeeding	1	2	3	4	5