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Whispers2mom: a Young Adult Prenatal Text Messaging Intervention

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WHISPERS2MOM:

A YOUNG ADULT PRENATAL TEXT MESSAGING INTERVENTION

by

Christine P. Laurent

A Dissertation Submitted in

Partial Fulfillment of the

Requirements for the Degree of

Doctor of Philosophy

in Nursing

at

The University of Wisconsin-Milwaukee

May 2018

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A YOUNG ADULT PRENATAL TEXT MESSAGING INTERVENTION

by

Christine P. Laurent

The University of Wisconsin-Milwaukee, 2018
Under the Supervision of Dr. Jennifer Doering

Purpose: To evaluate the feasibility of Whispers2Mom, a prenatal text messaging educational

intervention designed for young adults, 18 to 26 years old. The findings of this study may inform

nursing strategies to improve breastfeeding intention and rates in the emerging adult population.

Background: Childbearing young adults are among the least likely populations to breastfeed, yet

their infants stand to benefit greatly from breastfeeding. Current methods of prenatal education have

failed to increase rates of breastfeeding intention or initiation.

Methods: The feasibility of the Whispers2Mom prenatal text messaging program was evaluated

through exploration of adherence and acceptability using a mixed methods design. Prior to data

collection, daily text messages were delivered for one month. Texts addressed breastfeeding

practices, barriers to breastfeeding, strategies for overcoming barriers, and these texts augmented

usual prenatal care practices. A convenience sample was recruited. Data were collected using surveys

and semi-structured interviews with 14 participants. Interviews were analyzed using thematic

analysis.

Results: The original intent was to recruit adolescents for this study, but due to many challenges with

recruitment, the final sample was comprised only of young adults. Participants were on average 24

(SD= 2.4) years old, high school graduates, and married or partnered. Participants were adherent in

using the Whispers2Mom prenatal text message program. Participants indicated that they found the

Whispers2Mom prenatal text message program to be acceptable. Generally, the texts were helpful,

informative, and provided good information. Several of the interview responses indicated increasing

feelings of attachment to baby.

Conclusions: Findings suggest the Whispers2Mom intervention, as measured by self-report of

acceptability and adherence was feasible. The prenatal text messaging intervention Whispers2Mom,

when used as an educational tool, may be an appropriate adjunct to usual care practices. Given the

positive preliminary results in this study and the fact that technology is a common and important part

of the young adult's life, text messaging may be an efficacious addition to interventions that already

exist for health promotion and disease prevention during the prenatal period in emerging adults.

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LIST OF ABBREVIATIONS

AAP. American Academy of Pediatrics (AAP, 2005; 2012b; 2015).

ADA. American Dietetic Association (ADA, 2009).

ACOG. American College of Obstetricians and Gynecologists (ACOG, 2007a, 2007b).

AWHONN. Association of Women's Health, Obstetrics, and Neonatal Nurses. (AWHONN, 2013)

CDC. Centers for Disease Control and Prevention. (CDC, 2010, 2012).

e-Health. Healthcare practices supported by electronic processes and communication, primarily the computer and the Internet (Reguly, 2009).

IFI. Infant Feeding Intentions Scale (Nommsen-Rivers & Dewey, 2009)

ILCA. International Lactation Consultant Association. (ILCA, 2013)

IM'ing. Instant messaging

m-Health. Mobile health, a way to communicate health information through mobile devices (Sherry & Ratzen, 2012).

USBC. United States Breastfeeding Committee. (USBC, 2011).

USDHHS. United States Department of Health and Human Services. (USDHHS, 2011a; 2011b; 2012)

WIC. Women, Infants and Children. (USDA, 2011).

WHO. World Health Organization. (WHO, 2003; 2008; 2010 2014a; 2014b).

ACKNOWLEDGMENTS

I would like to express my thanks beyond measure to Dr. Jennifer Doering, whose assistance in achieving my goal is nothing short of a superhuman effort. I would never have been able to do this without your constant support and endless patience. I learned so much from you, about completing a dissertation and especially about never giving up. Your respect for my work and dedication to my success was obvious from day one. You are my hero.

Dr. Karen Morin, I am so thankful to have you in my life. I struggle to express how much I appreciate your generous offer to stay on as a committee member. You taught me so much through the years with your wonderful advice, practical suggestions, and expert editing. My path was full of challenges but you helped me navigate them all. I cannot imagine having done this without you.

Dr. Teresa Johnson, your ability to help me think outside the box is amazing. I loved our discussions. Your ideas are always practical, and your feedback has been absolutely invaluable. Thank you for your guidance, hard work, and effort on my behalf. You are an inspiration to me.

Dr. Melinda Kavanaugh, it was such a pleasure working with you. You have amazing insight into this topic. Your vision for this study added so much and really turned my thinking around. I marvel at how much I learned from you in such a short time. Thank you for being so generous in sharing your enthusiasm and expertise with me.

To my study participants who offered to receive the texts for a month and then meet with me, thank you for allowing me into your lives at this special time. I felt privileged to share in your journey if just for this little while. Congratulations on this next chapter of your lives.

I'd like to dedicate this to Sylvia and Raymond Wall- Mom, Grandpa, I did it! And finally to my family- I'm back!

CHAPTER ONE

Breast milk is widely accepted as the ideal nutrition for infants with important immunological health benefits (American Dietetic Association (ADA), 2009; Godfrey & Meyers, 2009; Ip et al., 2007; United States Department of Health and Human Services (USDHHS), (2011a). Breast milk has physical and psychological health benefits for mothers as well (ADA, 2009; Godfrey & Meyers, 2009; Ip et al., 2007; American College of Obstetricians and Gynecologists (ACOG), 2007a; 2007b; Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN), 2015). Understanding the health benefits of breastfeeding can have a positive influence on a mother's decision-making process to breastfeed (Wambach & Cohen, 2009). Despite the known health benefits of breastfeeding, mothers (especially adolescent and young adult mothers) continue to choose not to breastfeed (United States Breastfeeding Committee (USBC), 2011; Wambach et al., 2011).

There are barriers to breastfeeding related to culture and ethnicity (USDHHS, 2011b), social factors (Arora, McJunkin, Wehrer, & Kuhn, 2000), and age (Hansen & Wambach, 2011; Nesbitt et al., 2012). Investigators looking at barriers to breastfeeding specifically among young minority and low-income women found that fear of pain, embarrassment with public exposure, unease with the act of breastfeeding, reports of ridicule by friends, and lack of support from some healthcare providers were perceived as barriers (Arora et al., 2000; Grady & Bloom, 2000; Spear, 2007). Specific barriers to breastfeeding related to social factors include the mother's perception of the father's attitude, and return to work (Arora et al., 2000). Barriers to breastfeeding among adolescent mothers include lack of support, its impact on social and intimate relationships, the physical demands of breastfeeding, lack of knowledge of breastfeeding practices and benefits, perceived sense of discomfort in breastfeeding in general,

and perceived sense of discomfort with breastfeeding in public (Hansen & Wambach, 2011; Nesbitt et al., 2012). In this chapter the problem, the research questions, and the significance is presented.

Problem Statement

In 2013, the number of births registered in the United States was 3,932,181, a decrease of less than 1% of the number of births registered from the year before (Martin, Hamilton, Osterman, Curtin, & Matthews, 2015). The number of births to adolescents aged 18-19 declined, falling from 51.4 births per 1000 women in 2012 to 47.1 births per 1000 women in 2013 (Martin et al., 2015). The total number of births registered to teenagers aged 18 to 19 years in 2013 was 199,407 (Ventura, Hamilton, & Mathews, 2014). While it is true that the number of adolescent births is declining, it is also true that adolescents giving birth remains a health concern for the United States. The social and economic disadvantages that adolescent mothers face increase their infants' risks for morbidity, mortality, and delays in development (Brown & Suellentrop, 2009; Mossman, Heaman, Dennis, & Morris, 2008).

Human milk is the ideal food for most infants (American Academy of Pediatrics (AAP), 2005; ADA, 2009; ACOG, 2007a; ACOG, 2007b; Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN), 2015; McDowell et al., 2008; USBC, 2011). Not only does breastfeeding provide significant nutritional benefits, it provides protective factors for both infants and mothers as well. These health benefits and protective factors have positive and lifelong implications that include supporting infant brain development, and promoting attachment behaviors between mother and baby (ACOG, 2007a; 2007b; ADA, 2009; Godfrey & Meyers, 2009; Ip et al., 2007; Maguire-Jack, Kibble, Cranley, & O'Connor, 2010; USDHHS, 2011a; Wambach et al., 2011). The health risks associated with not breastfeeding include

increased incidence of acute otitis media, eczema, and asthma, etc. for the infant, and increased

incidence of breast and ovarian cancer for the mother (USDHHS, 2011b) (Table 1).

Table 1

Health Outcomes and Excess Risk Associated with Not Breastfeeding

Among full-term infants	Health Outcomes Excess Risk (%)
Acute ear infection (otitis media)	100
Eczema (atopic dermatitis)	47
Diarrhea and vomiting (gastrointestinal infection)	178
Hospitalization for lower respiratory tract diseases in the first year	257
Asthma, with family history	65
Asthma, no family history	35
Childhood obesity	32
Type 2 diabetes mellitus	64
Sudden infant death syndrome	56
Among preterm infants	
Necrotizing enterocolitis	138
Among mothers	
Breast cancer	4
Ovarian Cancer	27

(USDHHS, 2011b)

In the United States, the breastfeeding rate overall increased between 1993 and 2006, the

percentage of infants who were ever breastfed increased from 60% among infants born in 1993-

1994 to 77% among infants born in 2005-2006 (McDowell, Wang, & Kennedy-Stephenson,

2008). Breastfeeding initiation increased from 74.6% in 2008 to 76.9% in 2009 births; this improvement in initiation represents the largest annual increase over the previous decade (CDC, 2013b). The Breastfeeding Report Card United States/2013 reported that the percentage of babies who were breastfed in 2012 in the United States was also 77% (CDC, 2013a).

The evidence suggests that breastfeeding rates increase significantly with increasing maternal age (McDowell et al., 2008; Wambach et al., 2005). The breastfeeding rate of mothers under 20 years of age (43%) was much lower when compared to the breastfeeding rates of mothers who were 20-29 years of age (65%), or 30 years of age and older (75%) (McDowell et al., 2008). In general, while breastfeeding rates over the past several years have increased (McDowell et al., 2008), adolescent breastfeeding rates are declining (Nelson, 2009).

According to Hanson and Wambach (2011) among the vulnerable adolescent population, breastfeeding research has been limited. The evidence suggests that breastfeeding information, both from professionals and significant others with breastfeeding experience, is valued by adolescents (Dykes, Moran, Burt, & Edwards, 2003). Professional support has been used to increase breastfeeding rates in the adolescent population (Dykes et al., 2003; Moran, Dykes, Burt, & Shuck, 2006). Adolescents often need more professional support, as well as education during pregnancy and the postpartum period than do their adult counterparts (Montgomery, 2006). This is due in part to the fact that adolescents have fewer life experiences, which make them less likely to be able to adjust to the demands and challenges of pregnancy and giving birth (Montgomery, 2006). Adolescent mothers are influenced by their personal and professional support systems that influence their breastfeeding intention both before and after giving birth (Pentecost & Grassley, 2014; Wambach & Cohen, 2009).

Important people in an adolescent's immediate environment may influence an adolescent's behavior. These people include mothers, partners, friends, and sisters all of whom may encourage or discourage breastfeeding by giving advice and sharing opinions they may have (Dykes et al., 2003; Hannon, Willis, Bishop-Townsend, Martinez, & Scrimshaw, 2000; Nelson & Sethi, 2005). It is possible that these opinions, as well as opportunities to observe others breastfeeding, may influence the adolescent's breastfeeding behaviors. Expectant adolescent mothers deal with the challenges of their own development (including reaching sexual and reproductive maturity) as they face the additional requirements of adjusting to the adult role of parenting (Afifi, 2007). In addition, adolescent mothers may lack knowledge of appropriate parenting behaviors (Maguire-Jack et al., 2010).

Mobile devices have been adopted by adolescents quickly because instant messaging (IM'ing) and text messaging are convenient, inexpensive, and fast (Bryant, Sanders-Jackson, & Smallwood, 2006; Grinter & Eldridge, 2001; Kasesniemi & Rautianinen, 2002; Lenhart, Madden, & Hitlin, 2005; Lenhart, Rainie, & Lewis, 2001; Ling & Yttri, 2002). Adolescents use their mobile devices to enhance communication among friends and family, to make plans, and to maintain social contacts (Bryant et al., 2006; Grinter & Eldridge, 2001, 2003; Grinter & Palen, 2002; Lenhart et al., 2005; Lenhart et al., 2001; Schneider & Hemmer, 2005; Valkenburg & Peter, 2005). One way to meet the educational needs of pregnant adolescent mothers may be by providing information and support through mobile devices that support health (m-Health).

M-Health is a means by which to communicate health information through mobile devices, like cell phones (Sherry & Ratzen, 2012). Inspection of the evidence suggests that m-Health technology can modify adolescent behavior through education, encouragement, and engagement (Armstrong et al., 2009; Olson, 2012). Investigators have documented adolescent

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behavior changes related to the use of m-Health interventions in several different studies. The focus of these studies included assessment of health information needs (Schnall et al., 2013; Skinner, Biscope, Poland, & Goldberg, 2003); the assessment of asthma symptoms and adherence (Mulvaney et al., 2013); diabetic self-efficacy and adherence to treatment (Cafazzo, Casselman, Hamming, Katzman, & Palmert, 2012; Franklin, Waller, Pagliari, & Greene, 2006; Patrick, Griswold, Raab, & Intille, 2008); and mental health issues (Reid et al., 2012; Reid et al., 2013).

Text messaging is an m-Health intervention that has the potential to be an inexpensive, widely accessible, and instant intervention to impact behavior change among expectant mothers (Evans, Abroms, Poropatich, Nielsen, & Wallace, 2012; Jordan, Ray, Johnson, & Evans, 2011). An example of an m-Health application is Text4Baby, a prenatal text messaging program introduced in February 2010 (CDC, 2012a). Inspection of preliminary Text4Baby findings suggests that the behaviors of participants can positively influence their health by increasing users' health knowledge, interaction with healthcare providers, adherence to appointments and immunizations, and access to health resources (Jordan et al., 2011; Office of Communications, Cal State San Marcos, 2011).

The preliminary Text4Baby data have suggested a positive impact on participants' health knowledge, interaction with healthcare providers, adherence to appointments and immunizations, and access to health resources (Office of Communications, Cal State San Marcos, 2011). However, it is important to note that the Text4Baby program does not focus on the needs of adolescents and the data are not specific to this population (Jordan et al., 2011). In addition, the Text4Baby program has not been evaluated for its impact on participants' breastfeeding intention. Text messaging interventions have also not been evaluated as an efficacious means of

adolescent prenatal education in general, nor breastfeeding education in particular. Therefore, this study examined the feasibility and efficacy of an intervention focused on 18 to 19-year-old adolescents that consisted of sending daily prenatal text messages about general pregnancy topics including two text messages each week pertaining to breastfeeding.

Theoretical Framework

The Ecological Systems Theory (Bronfenbrenner, 1979), the Ecological Techno-Subsystem (Johnson & Puplampu, 2008), and the Developmental Model of Prenatal Attachment (Doan & Zimerman, 2003) were part of the original framework for this study. In addition, the Theory of Reasoned Action (Fishbein & Ajzen, 1980) was also used. But when methodological issues arose, the Theory of Planned Behavior (Ajzen, 1991) was deemed to be a better way to address breastfeeding intention, and so was used instead (Figure 4). These theories are related in the ways they address specific developmental needs of the pregnant adolescent as she decides how to feed her baby, and will be discussed in the following section both individually and in the ways that they are interconnected.

Ecological Systems Theories (Bronfenbrenner, 1979; Johnson & Puplampu, 2008)

The Ecological Systems Theory (Bronfenbrenner, 1979) and the Ecological Techno-Subsystem (Johnson & Puplampu, 2008) consider the social contexts in which adolescents develop, including the important influences on their development and behavior. Bronfenbrenner identified five environmental systems that represent individual interrelationships within society: microsystem, mesosystem, exosystem, macrosystem, and chronosystem (Bronfenbrenner 1979). When the Ecological Systems Theory (Bronfenbrenner, 1979) was introduced, the influence of technology on adolescent development was not fully appreciated (Johnson & Puplampu, 2008). Since that time, the tremendous influence technology has on adolescent development in ways

like the Internet, portable audio devices, cell phones, and texting, Facebook, etc. has become better understood. Johnson and Puplampu (2008) created a model based on Bronfenbrenner's Ecological Systems Theory (Bronfenbrenner, 1979) in which the system that reflects the adolescent's immediate environment (microsystem) was expanded to include influences that are both living (family- including the baby, and friends, etc.) as well as non-living (technology, etc.). Therefore, for the purposes of this study, discussion of the theoretical underpinning will focus on the microsystem as described by Bronfenbrenner (1979), as well as the techno-subsystem as described by Johnson and Puplampu (Figure 1). Representation of the microsystem and techno-subsystem as they pertain to the proposed study are in Figure 2.

Bronfenbrenner's (1979) Ecological Systems Theory, and Johnson and Puplampu's (2008) Ecological Techno-Subsystem inform this study by consideration of the impact of the immediate environment, including technology, on the adolescent's microsystem (Table 2). The microsystem is the most basic system of Bronfenbrenner's (1979) Ecological Systems Theory. It refers to the settings in which the individual lives and functions, including the family, neighborhood, and school environments. In terms of its effect on the development of the individual, the microsystem has a tremendous impact. For the purposes of this study, Johnson and Puplampu (2008) expanded the microsystem to include the techno-subsystem and the influence of cell phones, especially as they are related to text messaging, on the adolescent's immediate environment. Therefore, important influences within the microsystem include the social relationships within an individual's life, such as family members (including the baby), friends, peer group(s), neighbors, schoolmates, as well as technology, in particular cell phones. The microsystem has the largest impact on the adolescent because that is where he or she spends the most time and has the most individual interactions with others.
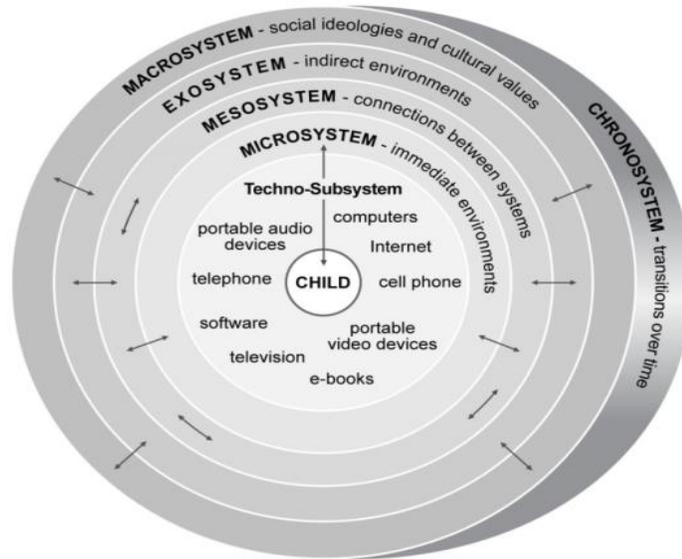
Figure 1

Ecological Techno-Subsystem (Johnson & Puplampu, 2008

Figure used with permission (Appendix A)
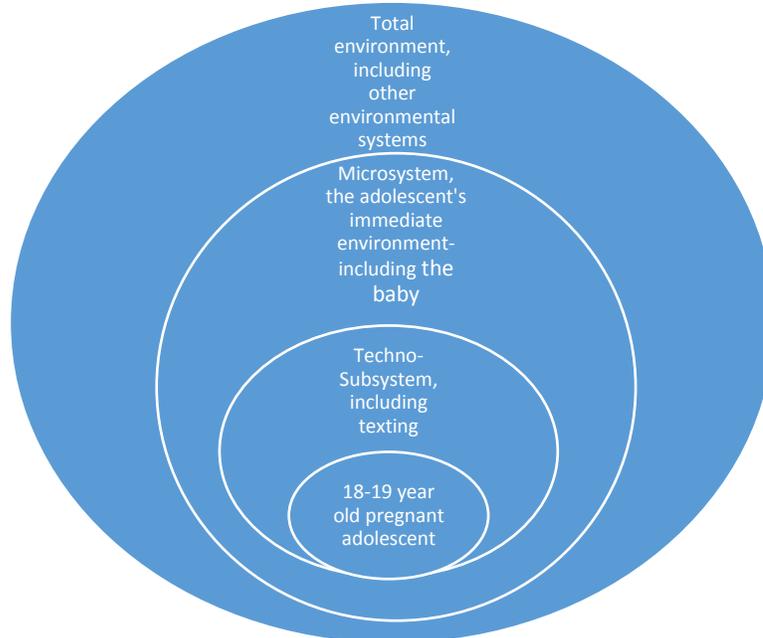
Figure 2

Ecological Techno-Subsystem (Johnson & Puplampu, 2008), as it pertains to this study

Table 2

Ecological systems as they pertain to this study

Ecological System	Influences found within the ecological system
Techno-Subsystem	Technology: Portable audio devices, computers, cell phones, text messaging , Whispers2Mom, software, portable video devices, e-books, Internet, telephone, etc.
Microsystem	Immediate environment: Family (including the baby), friends, neighborhood, and school environments

According to Bronfenbrenner (1979) and Johnson and Puplampu (2008) adolescents operate within a social ecological context. This theoretical perspective provides support for understanding adolescent needs related to their health and well-being. The Whispers2Mom text messages were developed using this theoretical perspective, incorporating the roles, norms and rules that influence an adolescent as he or she grows and changes within his or her environment.

It is important to consider adolescents within the context of their microsystem, as described by Bronfenbrenner (1979) and the techno-subsystem as described by Johnson and Puplampu (2008), because this environmental system has the greatest impact on the adolescent's life. Many adolescent mothers face socioeconomic challenges, and the evidence suggests that there exists a strong relationship between the challenges adolescent mothers face and low rates of

breastfeeding (Feldman-Winter & Shaikh, 2007; Smith, Avery & Gizlice, 2004; Smith, Coley, Labbok, Cupito, & Nwokah, 2012). The relevance of Bronfenbrenner's (1979) Ecological Systems Theory and the Ecological Techno-Subsystem (Johnson & Puplampu, 2008) to this study is that they provide the context by which to examine social influences on the adolescent.

Understanding the developmental stage of pregnant adolescents is an important part of planning for their health care needs. Nelson and Sethi (2005) suggest that the learning process inherent with breastfeeding is an important part of adolescent mothers' breastfeeding experiences. The adolescent may feel overwhelmed and fearful when making the decision about which infant feeding method to choose (Magness, 2012). An adolescent mother faces many challenges to successful breastfeeding that are unique to her age and the context of her life. These challenges include dealing with the possible stigma and embarrassment of being a teen mother, not being fully ready to assume the responsibilities of being a mother, needing peer acceptance, and needing social support that may or may not be a positive influence on breastfeeding (Feldman-Winter & Shaikh, 2007). Whispers2Mom is a prenatal intervention developed with adolescents' needs in mind which may help the adolescent mother successfully face the challenges of pregnancy, birth, and breastfeeding through education and support.

In summary, each of the Whispers2Mom text messages reflects the microsystem because they address influences from within the adolescent's immediate environment. The techno-subsystem is a part of each of the text messages, because they are an important aspect of the technological part of the adolescent's immediate environment. Theoretical connections between the Whispers2Mom text messages and the Ecological Systems Theory (Bronfenbrenner, 1979) and Ecological Techno-Subsystem (Johnson & Puplampu, 2008) are provided in a table in Appendix H.

Developmental Model of Prenatal Attachment (Doan & Zimerman, 2003; 2008)

Doan and Zimerman (2003; 2008) suggest that the relationship between a pregnant woman and her fetus is important because it may influence behaviors that occur before and after birth. The evidence suggests that two factors in particular influence prenatal attachment: empathy and cognition (Doan & Zimerman, 2003; Doan & Zimerman, 2008; Zimerman & Doan, 2008). Developmentally, according to this model, strategies and skills associated with prenatal attachment begin in childhood and become evident in adolescence and adulthood, especially once the individual becomes pregnant.

During adolescence and early adulthood, the skills and strategies needed for prenatal attachment may vary, and therefore so will the potential for prenatal attachment (Doan & Zimerman, 2008). In order for prenatal attachment to occur, there are certain key attributes that need to be in place. For instance, cognitive skills such as having the ability to think abstractly and mentally represent someone else are necessary (Doan & Zimerman, 2008). Cognitively, mothers fantasize about their unborn children and create mental representations about what the baby will be like, and the evidence suggests that without the ability to create an understanding of the fetus as a separate person, prenatal attachment would be low (Doan & Zimerman, 2003). In terms of emotional development, empathy is necessary, and this means being able to have concern for others, or being able to be sensitive to others' needs, and separate self from "other". For the purposes of the proposed study, self refers to the adolescent, and "someone else" and "other" refers to the unborn baby.

According to Doan and Zimerman (2003; 2008) the Developmental Model of Prenatal Attachment posits that the beginning of prenatal attachment can happen at different times: at conception, in the first trimester, after fetal movement is felt, in the third trimester, or it may not

occur at all. The levels of prenatal attachment vary as well, from low to medium to high. Finally, Doan and Zimerman define prenatal attachment in four different ways: cognitive attachment, emotional attachment, attachment behaviors, and self-care practices. Cognitive attachment is having the ability to think of the fetus as a separate person. Emotional attachment means having empathy for the fetus. Attachment behaviors are ways in which the mother responds to and interacts with the fetus; and self-care practices refer to engaging in good health practices (Doan & Zimerman, 2003; 2008).

The Whispers2Mom prenatal text messaging intervention may strengthen the potential for prenatal attachment in the adolescent by targeting the four different expressions of prenatal attachment. The theoretical connections of the different expressions of prenatal attachment for each of the text messages in the Whispers2Mom intervention are in Appendix H.

The Reasoned Action Approach (Fishbein & Ajzen, 2010)

The Reasoned Action Approach assumes that human social behavior follows from the beliefs that people have about the behavior (Fishbein & Ajzen, 2010). The Reasoned Action Approach proposes there are three kinds of beliefs that influence the individual's decision about whether or not to engage in the behavior. The first belief is attitude, or the individual's feelings about the consequences- positive or negative- of performing the behavior. Perceived social norms is the second belief, addressing whether people important to the individual would approve or disapprove of the behavior. The third belief is perceived behavioral control, or how personal or environmental factors help, or do not help, the behavior (Fishbein & Ajzen, 2010). Each of the individual beliefs that influence the individual's decisions about engaging in a behavior are found in the following paragraphs.

Attitude refers to an individual's disposition, belief, or opinion about something (Agnes, 2002). Fishbein and Ajzen (2010) define attitude as the tendency to respond favorably or unfavorably to a psychological object. When an attitude about a particular behavior is formed, it becomes associated with certain judgments about the outcome of the behavior, which ultimately is considered either positive or negative. In that way the individual forms his or her attitude about the behavior. The result is either formation of a positive attitude by valuing behaviors that have desirable outcomes, or a negative attitude by not valuing behaviors that have undesirable outcomes (Fishbein & Ajzen, 2010). For the proposed study, attitude refers to the degree to which the adolescent has a favorable or unfavorable opinion about breastfeeding. TheWhispers2Mom text messages will provide information that may positively affect the adolescent's attitudes about breastfeeding and other topics by explaining the benefits of breastfeeding and self-care while providing strategies to be successful while engaging in those behaviors.

Subjective norm refers to the perceived social pressure to perform or not to perform the behavior (Fishbein & Ajzen, 2010). Normative beliefs are associated with the idea that people important to the individual influence whether they engage in a behavior or not by approving or disapproving of it. In general, if the individual's perception is that more people approve rather than disapprove of the behavior, then the individual will experience more social pressure to engage in the behavior (Fishbein & Ajzen, 2010). For the purposes of the proposed study, subjective norm refers to the adolescent's perception of social pressure (in particular the influence from physicians, nurses, health care providers, and important others) to breastfeed or not. The Whispers2Mom text messages will provide information that may positively influence the adolescent's intention to breastfeed by emphasizing the benefits of breastfeeding and self-

care with support from influential people like physicians, nurses, health care providers and others with instructions to consult with them when questions arise, as well as attend breastfeeding classes, among other things.

The Reasoned Action Approach (Fishbein & Ajzen, 2010) posits that an individual's control over their behavior relates to having both the opportunity and resources to engage in the behavior. If control beliefs identify more factors that help than hinder the behaviors, then perceived behavioral control should be high (Fishbein & Ajzen, 2010). In general, as far as actual behavioral control is concerned, if an individual intends to perform the behavior, has the opportunity and resources to do so, then they should be successful. Bandura (1977a; 1982) suggests that the individual's perception of behavioral control (or perceived self-efficacy) has an important impact on their intentions and behaviors.

Perceived behavioral control plays an important part in the Reasoned Action Approach (Fishbein & Ajzen, 2010) because it influences an individual's beliefs about what they can do. The Reasoned Action Approach helps inform one about how individuals view their confidence in their own ability. The self-efficacy beliefs help individuals choose: the behaviors in which they engage; how to engage in the behaviors; the amount of effort needed for the behaviors; and the cognitive and emotional reactions to the behaviors. The assumption is that motivation and ability work together to influence an individual's behaviors; thus, intentions influence behavior to the extent that the individual has behavioral control. In general, behaviors should increase with behavioral control when the person is motivated to try. Adolescents have the opportunity to breastfeed after giving birth; the Whispers2Mom text messages will provide prenatal information and support related to breastfeeding. In this way, the Whispers2Mom intervention may positively

affect the adolescent's perceived behavioral control by providing information and support related to practical strategies to use in order to be successful at breastfeeding and self-care.

An important aspect of the Reasoned Action Approach (Fishbein & Ajzen, 2010) is the individual's intention to perform a behavior. According to the Reasoned Action Approach, attitudes, perceived social norms, and perceived behavioral control guide intention and behavior (Fishbein & Ajzen, 2010). Intentions are related to the motivation an individual feels; typically, the stronger the intention, the more likely the behavior will be performed. If the predictors of intention are more favorable, the Reasoned Action Approach (Fishbein & Ajzen, 2010) holds that then the individual's intention to engage in the behavior will be stronger; however, the relative importance of any of the predictors will vary. The associations between the predictors of intention and individual text messages in the Whispers2Mom intervention are in Appendix H.

Interconnectedness of Theories

The four different theories described above are interconnected and form a framework for the Whispers2Mom prenatal text messaging intervention (Figure 3). The Ecological Systems Theory (Bronfenbrenner, 1979) and the Ecological Techno-Subsystem (Johnson & Puplampu, 2008) consider the social contexts in which adolescents develop, including the important influences on them. The Ecological Systems Theory (Bronfenbrenner, 1979) provides a way to understand the adolescent's immediate environment, or microsystem, which is the one in which he or she lives and functions. The techno-subsystem includes influences that are both living (family, friends, etc.) as well as non-living (technology, etc.) (Johnson & Puplampu, 2008). The influence of the microsystem to the adolescent is very important, and the techno-subsystem includes technology into the microsystem in all its forms, including text messages (Johnson &
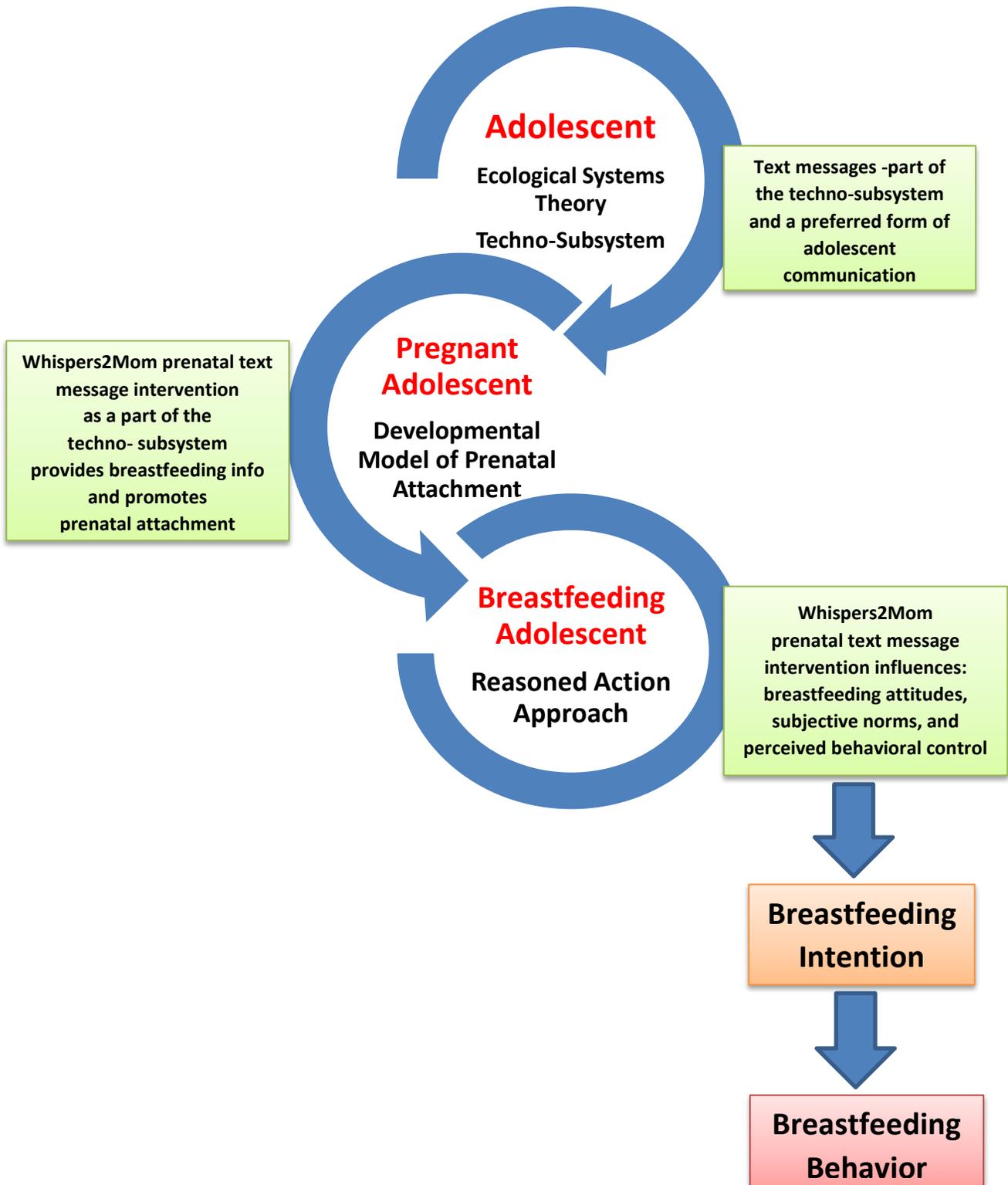
Figure 3

Interconnectedness of Theories- Initial Study Design

Puplampu, 2008). The evidence suggests that text messages are the adolescent's preferred form of communication (Lenhart et al., 2010a; 2010b).

Development of the Whispers2Mom prenatal text messages was accomplished with consideration of the techno-subsystem as well as the Developmental Model of Prenatal Attachment (Doan & Zimerman, 2003; 2008). The Developmental Model of Prenatal Attachment provides a framework by which Whispers2Mom prenatal text messages may promote prenatal attachment, with the text messages being worded as if they are originating from the baby. In this way, the adolescent mother may begin to understand that the baby is separate from her. This is an important first step in developing prenatal attachment and in reading the Whispers2Mom prenatal text messages, the adolescent mother may also begin to develop empathy and concern for her baby. Reading the Whispers2Mom text messages may help the adolescent mother learn ways to be sensitive to her baby's needs, which includes understanding the health benefits of breastfeeding for both her and the baby.

According to the Reasoned Action Approach, attitudes, normative beliefs, control beliefs, and intention guide behaviors (Fishbein & Ajzen, 2010). Using the Reasoned Action Approach (Fishbein & Ajzen, 2010), Whispers2Mom prenatal text messages were created to influence the adolescent's breastfeeding attitudes, subjective norms, and perceived behavioral control. The Reasoned Action Approach (Fishbein & Ajzen, 2010) provides a framework with which to understand how Whispers2Mom may positively influence breastfeeding intention, and ultimately breastfeeding behaviors.

Summary

The Whispers2Mom prenatal text messaging intervention is supported by four different theories that are related in the ways that they address specific developmental needs of the

adolescent as she experiences her pregnancy and makes decisions about how to feed her baby. The Ecological Systems Theory (Bronfenbrenner, 1979), the Ecological Techno-Subsystem (Johnson & Puplampu, 2008), the Developmental Model of Prenatal Attachment (Doan & Zimerman, 2003; 2008), and the Reasoned Action Approach (Fishbein & Ajzen, 2010) were discussed individually and collectively in the preceding section.

Purpose

The purpose of the proposed study was to determine the feasibility (adherence and acceptability) and efficacy (breastfeeding intention) of implementing a developmentally appropriate adolescent prenatal text messaging intervention, Whispers2Mom, used in conjunction with usual prenatal care practices.

Research Questions

Research Question 1

What is the feasibility of the Whispers2Mom prenatal text messaging intervention as evaluated by participant self-report of adherence?

Research Question 2

What is the feasibility of the Whispers2Mom prenatal text messaging intervention as evaluated by participant self-report of acceptability?

Research Question 3

In 18 to 19-year-old adolescent mothers using the Whispers2Mom prenatal text messaging intervention, how does breastfeeding intention vary by observational breastfeeding experiences?

Conceptual and Operational Definitions

Acceptability. Acceptability refers to something that is deemed to be adequate or satisfactory (Agnes, 2002)**.** For this study, acceptability was the extent to which the prenatal text messaging intervention was determined to be satisfying to program participants (Bowen, et al., 2009). Acceptability was measured with several questions in the interview process. These items ask if program participants felt satisfied with: the prenatal text messages in general; in terms of frequency; whether they felt the text messages provided helpful information; and finally whether they would recommend the prenatal text messages to a friend.

Adherence. Adherence refers to sticking to or staying attached to something (Agnes, 2002). The rate of adherence was evaluated by participant self-report of the number of times per week the text messages are read, a question that was asked in the focus group/individual interviews.

Adolescent. A person in the period of life that begins with puberty and ends with physical maturity (Stegman, 2005). For this study, an adolescent was a woman aged 18 to 19 years old.

Attachment. Attachment is a connection made by ties of devotion or affection (Agnes, 2002). In this study, prenatal attachment referred to the connection made by ties of devotion or affection between the adolescent and her developing fetus. This definition is provided for clarity but attachment was not measured.

Attitude. Attitude refers to one's disposition or opinion about something (Agnes, 2002). For this study, attitude referred to the degree to which the adolescent has a favorable or unfavorable opinion about breastfeeding. This definition is provided for clarity, but attitude was not measured.

Breastfeeding. A feeding method that requires that an infant receives human breast milk. (WHO, 2008).

Breastfeeding intention. Breastfeeding intention is a measure of a woman's intention to feed her infant exclusively with human breast milk (Nommsen-Rivers & Dewey, 2009). This information was indicated by participant responses to the first two items of the Infant Feeding Intentions Scale (Nommsen-Rivers & Dewey, 2009) (Appendix B).

Breastfeeding observational experience. For this study, breastfeeding observational experience is an adolescent having the opportunity to watch a mother breastfeed her infant. This definition was provided for clarity, but breastfeeding observational experience was not measured.

Efficacy. The capacity for producing a desired result or effect; effectiveness (Agnes, 2002). Efficacy was defined as breastfeeding intention, and was measured by participant responses to the first two items of the Infant Feeding Intentions Scale (IFI) (Nommsen-Rivers & Dewey, 2009) (Appendix B).

E-Health. Healthcare practices supported by electronic communication, especially the computer and the Internet (Reguly, 2009).

Feasibility. Feasibility is defined as adherence, or the extent to which patients follow the instructions they are given for prescribed treatments or interventions (Bissonnette, 2008). In this study, **adherence** was indicated by participants in answering an interview question which asked how often the text messages were read. **Feasibility** was also measured by acceptability, or the extent to which study participants were satisfied with the intervention.

Intention. Intention is an individual's determination to act in a certain way (Agnes, 2002). According to Ajzen (1991), intention refers to how hard an individual is willing to work

in order to perform a behavior. For this study, breastfeeding intention referred to the adolescent's plan to breastfeed and was measured by participant responses to the first two items of the IFI (Nommsen-Rivers & Dewey, 2009) (Appendix B).

M-Health. A form of e-Health; a way to communicate health information through mobile devices (Sherry & Ratzen, 2012). M-Health was conceptualized as text messaging, the sending of short text messages electronically from one cellular network to another (Merriam-Webster, 2013) in the Whispers2Mom prenatal text messaging intervention.

Perceived behavioral control. Perceived behavioral control is the perceived ability or inability to perform a behavior; it is assumed to reflect both past experience and challenges and obstacles that may be encountered in the future (Fishbein & Ajzen, 2010). For this study, perceived behavioral control referred to the perceived ability to navigate the challenges and obstacles adolescents encounter with breastfeeding. This information was for understanding, and was not measured.

Subjective norm. Subjective norm refers to the perceived social pressure to perform or not to perform a behavior (Ajzen, 1991). For this study, subjective norm referred to the adolescent's perception of social pressure (from physicians and health care providers) to breastfeed. This information was for understanding and was not measured.

Usual care practices. Usual prenatal care practices refer to regular checkups employed during pregnancy to ensure consistent care that can help keep mother and baby healthy. Usual prenatal care practices help providers recognize problems if they occur, and prevent problems during labor and birth. Typically, routine checkups occur every four weeks for the first 28 weeks, every 2-3 weeks until week 36, and weekly for weeks 36 to birth (ACOG, 2013; Office on Women's Health, 2010).

Assumptions

This study had the following assumptions:

1. Human breast milk is the ideal human food for newborns (AAP, 2005, 2012; WHO, 2010.

2. Breastfeeding is an intervention that can help prevent acute and chronic disease in both mother and baby (Renfrew, et al., 2012)

3. Breastfeeding is beneficial in terms of the mother's investment of time and effort (Office on Women's Health, 2013)

4. Societal perspectives influence adolescent behaviors (Bronfenbrenner 1979, 1995, 2005; Bronfenbrenner & Morris, 1998, 2006; Johnson & Puplampu, 2008).

Significance to Theory, Practice, Research, and Policy

Theory

The study will contribute to nursing theory by adding to its theoretical knowledge base. The use of the Ecological Systems Theory (Bronfenbrenner 1979), the Ecological Techno-Subsystem (Johnson & Puplampu, 2008), Doan and Zimerman's (2003) Developmental Model of Prenatal Attachment, and the Reasoned Action Approach (Fishbein & Ajzen, 2010) have not been used together, specifically with the pregnant adolescent population. The four theories are unique, but together present a combined perspective that has application in guiding the exploration and understanding of what influences adolescent breastfeeding intention.

The examination of an intervention to increase breastfeeding in adolescent girls aged 18 to 19 will include the use of a theoretical framework that addresses both human behavior and adolescent development. Bronfenbrenner's Ecological Systems Theory (Bronfenbrenner, 1979) and Johnson and Puplampu's (2008) Ecological Techno-Subsystem, the Developmental Model of Prenatal Attachment (Doan & Zimerman, 2003; 2008), and the Reasoned Action Approach

(Fishbein & Ajzen, 2010), will undergird this study in which an intervention to increase adolescent breastfeeding will be examined. This is the first time these theories are combined to provide a framework for nursing research, and so will provide an important contribution to nursing. This may ultimately provide the nursing profession with another framework with which to guide the development of strategies to promote positive health outcomes for adolescents and their newborns.

Practice

Adolescents have an increased risk for premature and small-for-gestational-age infants and breastfeeding provides these infants with a number of health benefits specific to their needs (Chedraui, 2008). Adolescents are also at higher risk for ineffective maternal/newborn bonding, and breastfeeding has been shown to improve feelings of attachment (Lounds, Borkowski, Whitman, Maxwell, & Weed, 2005; Nelson, 2009). The protective factors available to the mother and baby through breastfeeding cannot be overstated. Nurses embrace health promotion through education about healthy behaviors like breastfeeding and finding an intervention to encourage breastfeeding among adolescents would be an important step in maximizing the health and wellness for themselves and their newborns. Therefore, if the Whispers2Mom is effective, then it might be one way to accomplish primary prevention efforts as an educational strategy for this population.

The use of m-Health technology in nursing practice may have the greatest potential for adolescents not only because text messaging has become an important part of adolescents' daily communication (Lenhart, et al., 2010), but because adolescents are early adopters of new technologies (Skinner, et al., 2003). Technology is all around us, and adolescents are accustomed to a wired world (Prensky, 2001). The Pew Internet and American Life Project (Lenhart et al.,

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2010) calls the millennial generation the generation that is always connected (Bull, 2010). The members of the Quality and Safety Education for Nurses (QSEN) Institute have determined that the use of information and technology to communicate, manage knowledge, reduce errors, and support decision-making is an essential skill for competency for pre-licensure nursing students (Cronenewett et al., 2007). If nurses can tap into m-Health technology as an intervention, then one more tool is available with which to educate, inform, and support patients. When nurses use text messaging to reach adolescents with a preferred means of communication, namely text messaging, nurses may be aided in their efforts to provide safe, patient-centered care for this population.

Research

Nelson (2009) suggests that while breastfeeding rates in general have increased since the 1990s, among members of the adolescent population there have not been significant gains. In fact, Feldman-Winter and Shaikh (2007) reported that the rates of breastfeeding among adolescents have actually been declining since 2003. Therefore, it is important to study interventions aimed at increasing adolescent breastfeeding rates. This study may provide preliminary evidence for the efficacy of implementing a developmentally appropriate adolescent prenatal text messaging intervention, Whispers2Mom, used in conjunction with usual prenatal care practices. Obtaining preliminary data through this study is an important first step before implementing the Whispers2Mom intervention on a larger scale. The data generated will help document the outcomes of prenatal text messaging as an intervention, with the use of that data for improving the quality of health care delivery systems.

Policy

Should the Whispers2Mom prenatal text messaging intervention study findings be found to be feasible and effective, midwives, obstetricians, family physicians, nurse practitioners, and pediatricians who care for adolescents, and in order to increase rates of breastfeeding, can further explore Whispers2Mom as an intervention. This would mean providing Whispers2Mom as a part of breastfeeding training and educational opportunities for healthcare professionals who care for pregnant adolescents. It would mean collaborating with medical and nursing schools to promote Whispers2Mom as an adjunct to usual prenatal care practices wherever adolescents access health care. It would involve promoting breastfeeding research in health care systems and by health care providers that focus on the evaluation and outcomes of Whispers2Mom.

The findings from this study may inform health departments and schools who provide health care and information to pregnant adolescents. Community-based and national organizations may use Whispers2Mom as an intervention in campaigns to promote breastfeeding. An adolescent breastfeeding public awareness campaign may prove to be a way to strengthen existing capacity and develop future capacity for conducting research on breastfeeding (USDHHS, 2011a; 2011b). Communication about Whispers2Mom may inform governmental agencies, which promote adolescent prenatal health. These agencies might include (but are not limited to): the National Institutes of Health, the United States Department of Health and Human Services, the National Healthy Mothers, Healthy Babies Coalition, the Health and Human Services Office on Women's Health, the Health and Human Services Office of Adolescent Health, the Agency for Healthcare Research and Quality, and the Centers for Disease Control and Prevention. Whispers2Mom data may be tracked through participant surveys in order to compare outcomes to standards of breastfeeding according to the following

agencies/organizations: CDC (2012b; CDC 2012c); WIC (USDA, 2011); WHO (2010); AWHONN (2007); ILCA (2013); and USBC (2011). Whispers2Mom program reports, compiled for the purposes of establishing a national monitoring system (USDHHS, 2011a), may improve the tracking of breastfeeding rates as outcomes.

Summary of Chapter One

Adolescent breastfeeding intention background and significance, the theoretical framework, assumptions, research questions, and conceptual definitions were discussed in this chapter. In the next chapter, adolescent breastfeeding literature, and gaps in the state of the science on adolescent breastfeeding intention are identified.

CHAPTER TWO

The purpose of this proposed research study was to determine the feasibility and efficacy of implementing a developmentally appropriate adolescent prenatal text messaging intervention, Whispers2Mom, to be used in conjunction with usual prenatal care practices, on the breastfeeding intention of 18 to 19-year-olds. The literature review includes an examination of adolescent factors influencing health behaviors including cognition, risk-taking, help-seeking behaviors, social support, communication, literacy, technology, and texting. Developmental factors like physical, mental, as well as emotional changes that influence adolescent health behaviors will be explored. The many different settings in which adolescent health education occurs will be discussed including: schools, e-Health, and m-Health. Adolescent prenatal education will be examined, especially in the areas of home visits, and the group visit model. Adolescent breastfeeding strategies including prenatal text messaging will be reviewed. Adolescent breastfeeding intention will be considered within the framework of the Ecological Systems Theory (Bronfenbrenner, 1979) and the Ecological Techno-Subsystem (Johnson & Puplampu, 2008). Finally, gaps in the science will be addressed.

Review of Relevant Empirical Studies

The literature review includes the examination of several different areas relevant to the discussion of adolescents in general and adolescent breastfeeding in particular. The review of the literature was performed by searching the Health Source: Nursing/Academic Edition (EBSCO), Academic Search Complete, CINAHL Plus with Full Text database for scholarly (peer reviewed) articles published within ten years, and limited to the United States. Theoretical literature is presented first followed by empirical literature on the topics unless indicated otherwise. The strength of the scientific evidence was evaluated using the Johns Hopkins Nursing Evidence

Based Practice Evidence Appraisal tool with "level one" being the highest and "level three" being the lowest; the quality of the scientific evidence was evaluated with the same tool with "A" being high quality, "B" being good quality, and "C" being low quality or having major flaws (American Nurses Association, 2014).

Adolescent Factors Influencing Health Behaviors

The many different changes that occur during the adolescent period and how those changes influence health behaviors will be explored in this section. The examination of developmental factors that influence adolescent health behaviors is important to understand because adolescence is a time of tremendous physical, mental, as well as emotional changes. Particular emphasis will be placed on cognition, autonomy and risk-taking, help-seeking behaviors, social relationships, communication, literacy, technology, and text messaging. In summary, adolescents undergo changes, they exhibit certain behaviors, many of the behaviors and changes experienced are influenced by social forces, and many of the behaviors and changes are at least somewhat predictable.

Cognition

Theoretical. Adolescents grow and develop rapidly and unevenly across different areas including the brain (Casey, Getz & Galvan, 2008; Kruse & Walper, 2008; McNeely & Blanchard, 2009; Turning Points, 2003). Adolescence is a time of intense brain changes with developmental differences in the physical, emotional, and cognitive domains attributed to the timing in development of the limbic system and frontal lobes (McNeely & Blanchard, 2009; Steinberg, 2008). The frontal lobes are the last area of the brain to become myelinated; they are responsible for processing higher cortical functioning like reasoning, problem solving, short-term memory, planning and executing behavior, language, motor function, social mirroring, judgment,

and impulse control (Johnson, Blum, & Giedd, 2009; Lickerman, 2008). This means that until the frontal lobes are fully developed (myelinated), other areas of the adolescent brain assume the function of processing higher cortical functions like decision- making. This is a major difference between the brain and cognitive functioning of adolescents as compared to adults.

Cognitive development is dependent on the biological development of the brain and is related to the decision-making process; therefore, adolescents tend to have less impulse control than adults, demonstrate fewer rational behaviors, and often make decisions based more on their feelings than on logical thought processes (Johnson et al., 2009; Lickerman, 2008). In the earliest development of adolescent cognition, ideas are concrete and interpretation is literal; as adolescence progresses, ideas become more abstract (Pintz, 2002). This means that the adolescent identifies and responds to rewards from risk-taking behaviors in the early and middle stages of adolescent development, and develops impulse control in the later stage of adolescent development (Johnson et al., 2009; Lickerman, 2008). This can have a negative impact on adolescent health and well-being, especially in the early and middle adolescent stages; in fact, adolescents have a higher likelihood than adults of engaging in risky health behaviors like drinking, smoking, having casual sex, committing violent and criminal behavior, and having fatal or serious automobile accidents (Steinberg, 2008); according to Feldman-Winter and Shaikh (2007) "the adolescent psyche is characteristically egocentric and short-sighted" (p. 363).

Empirical. Key words for the literature search for cognition included the words adolescent, cognition, and female. Sixteen studies were identified. Many studies were eliminated because they had nothing to do with cognition. Three studies reported on adolescents that were pre- and early adolescents instead of late adolescents (aged 18 to 19 years old) and were eliminated. Two more were from the Netherlands and Canada. One study was more appropriate

to a discussion of risk-taking (Bava & Tapert, 2010) and so will be addressed in that section. That left three studies to review and each is discussed in greater detail.

Najavits, Gallop, and Weiss (2006) conducted a randomized controlled trial of a coping skills treatment called Seeking Safety (SS) in a sample of adolescent females (n=33, M=16.06 years, SD = 1.22) who have the dual diagnoses of substance abuse disorder and posttraumatic stress disorder. The participants were randomly assigned to one of two groups: SS plus treatment as usual (defined as any treatment(s) in which the adolescent was already involved) or treatment as usual alone. The SS group was offered 25 sessions over three months and the treatment was modified for adolescents' developmental level. There were three outcomes measures related to cognition: Beliefs About Substance Use which assessed substance use disorder cognitions; Reasons for Using, which is derived from a substance use disorder expectancy questionnaire; and the World Assumptions Scale which assessed posttraumatic stress disorder cognitions (Navajits et al., 2006). Examination of the findings suggests that positive outcomes favored by the SS group related to cognitions about substance abuse disorder and post- traumatic stress disorder. The authors' conclusions were that SS shows promise for the adolescent female population experiencing the two diagnoses of substance abuse disorder and posttraumatic stress disorder. This study provides support for the use of developmentally appropriate interventions for adolescents to achieve positive outcomes related to cognition and was therefore included here in spite of the fact that the average age of the participants is younger than the participants in this proposed study.

Bekhet, El Guenidi, and Zauszniewski (2011) used a descriptive correlational cross-sectional design to examine alienation as it relates to resourcefulness and the healthy functioning of nursing students (both sexes). The convenience sample was 170 first year nursing students

(121 females, 49 males) who ranged in age from 17- 20 years (95.3% of students' ages ranged

between 17-19 years). The theoretical framework used was Zauszniewski's (2006) theory of

resourcefulness.

Resourcefulness in this study was defined as cognitive and behavioral skills that are used

to attain, maintain, or regain health (Bekhet et al., 2011). According to Zauszniewski (2006) the

constructs related to the theory of resourcefulness include both intrinsic factors (like personal

and social resourcefulness), extrinsic factors, intervening variables or process regulators (like

cognitions, affect, motivation, and energy), and quality of life outcomes (like physical,

psychological, and social functioning). The nursing students' cognitions were measured by the

Depressive Cognition Scale developed by Zauszniewski (1995). Inspection of the findings

suggests that alienation affects resourcefulness and that this relationship may be mediated by

positive cognitions, and supports the idea that by identifying beliefs that adolescents hold, their

ideas, feelings, and behaviors might be positively impacted. The researchers' conclusions were

that the findings from this study support prior research and point to a need to focus on organized

groups that provide social support for adolescents' sense of belonging and by association

strengthen adolescents' positive cognitions (Bekhet et al., 2011). This study provides information

about how adolescents think and the importance of social support in the development of beliefs,

feelings and behaviors, all of which may influence the adolescents' breastfeeding decision-

making process. This also provides support for the use of the Ecological Systems Theory

(Bronfenbrenner, 1979) with its emphasis on social support as the theoretical framework for the

proposed study.

Cohen, Farnia, and Im-Bolter (2013) compared the cognitive abilities, language skills

and reading comprehension of a sample of clinic referred 12-18 year olds (n=144, M=14.7 years,

SD= 1.44, 77 males) who were referred for mental health services with a sample of comparison

adolescents who were not referred for mental health services (*n*=186, *M*=15.36, *SD*=1.34, 95

males) in an effort to explore the connections between difficulties in higher order language skills,

reading, cognition, and social-emotional adjustment. Examination of the findings suggests that

clinic-referred adolescents scored lower than the comparison group on measures of structural and

higher order language, working memory, and reading (Cohen et al., 2013). Higher order learning

impairment was identified in 45% of the clinic-referred adolescents and in 15% of the

comparison group (Cohen et al., 2013). In addition, there were lower levels of nonverbal ability

and working memory along with lower levels of mother's education associated with greater risk

of higher order learning impairment (Cohen et al., 2013). The researchers' conclusions were that

this information has important implications for anyone who works with adolescents because

therapeutic techniques rely on techniques that employ therapeutic communication skills (Cohen

et al., 2013). In spite of the lower average age of the participants in this study as compared to the

participants in the proposed study, it was included here as relevant because connections between

difficulties in higher order language skills, reading, and cognition (as in understanding text

messages) and the possible social-emotional adjustment that adolescents facing a pregnancy may

encounter may need to be considered in the development of the prenatal text messaging

intervention.

       Critique. The scientific evidence for adolescent cognition was reviewed. The Najavits, et

al. (2006) study's strengths were: rigorous diagnoses at intake (participants meeting current

DSM-IV criteria for both posttraumatic stress disorder and substance use disorder); effect sizes

were largely in the moderate to high range, using Cohen's criteria of 0.20 for small, 0.50 for

medium, and 0.80 for high (Cohen, 1988). The findings from the Bekhet et al. (2011) and Cohen

et al. (2013) studies may be biased due to the fact that participants were self-selected. The

Bekhet et al. (2011) was a cross-sectional study that measured the variables at one point in time.

Finally, Najavits et al. (2006) report limitations such as small sample size, some missing data on

patients and measures, and the greater level of psychopathology in the treatment group as

compared to usual group at intake, despite randomization (Najavits et al., 2006).

Summary. In conclusion, the quality of the evidence from the studies is good from the

standpoint of how the studies were conducted; however, the study findings provide little

consistency with which the reader may draw conclusions. The adolescent does not think like a

child, nor like an adult, and understanding this developmental difference related to cognition has

important implications for the development of a prenatal text messaging intervention.

Adolescents think more from a short-term than long term perspective; therefore, it would be

beneficial for prenatal text messages to reflect this more immediate orientation and emphasize

the short term health benefits of breastfeeding to both mother and newborn.

Risk-Taking

Theoretical. Edwards-Hart and Chester (2010) described adolescence as a transitional

period which has a biological beginning and a sociological conclusion as an adolescent moves

from a functioning member of their individual family to a functioning member of society. MRIs

have shown that adolescents' brains demonstrate greater response to risky behaviors than adults;

inspection of the evidence suggests that teens experiencing risk-taking behaviors that produce a

desired outcome, with greater emotional satisfaction (Giedd, Blumenthal, & Jeffries, 1999).

Kruse and Walper (2008) discussed the concept of autonomy in adolescence as a process of

seeking independence while maintaining relatedness to others, especially parents. The uneven

nature of adolescent development places them at risk for being in situations they are not fully

prepared to handle; therefore, adolescents need the support and limits that parents and other adults can provide in order to keep them safe while they navigate the developmental task of independence (McNeely & Blanchard, 2009).

For most adolescents, knowing that a behavior has an associated risk does not mean they will stop doing that behavior; adolescents think about risks of behaviors differently than do adults (McNeely & Blanchard, 2009). Inspection of the evidence suggests that the decision-making process used in risk-taking activities has a biologic basis and differs between adults and adolescents, which may account for the differences in judgment that occur between adults and adolescents (Cohn, Macfarlane, Yanez, & Imai, 1995; McNeely & Blanchard, 2009; Steinberg, 2008;). McNeely and Blanchard (2009) studied the adolescent population and published a report to use as a resource for those working with adolescents entitled *"The teen years explained: A guide to healthy adolescent development."* In that report, the authors described how adolescents engage in risky behaviors like smoking, drinking or sex to gain approval from peers (McNeely & Blanchard, 2009). Developmentally, adolescents are in the process of acquiring reasoning and logic skills and can be assisted to make good decisions about engaging in risky behaviors. These risky behaviors include but are not limited to: asking open-ended questions that promote thinking and debate; never publicly criticizing an adolescent's ideas; helping to deepen their understanding with facts and accurate information; make sure adolescents appreciate the role of emotions in their decision-making process; and embracing their strengths (such as logic, common sense, creativity, etc.) (McNeely & Blanchard, 2009).

Empirical. A review of the literature was performed using key words late adolescent, risk-taking behaviors, and female. This search resulted in 15 "hits". The results were examined and the many of the studies were eliminated because they were about specific diseases or

conditions (like cystic fibrosis, traumatic brain injuries, etc.), certain procedures (egg freezing, etc.), or did not pertain to late adolescents. This process resulted in two studies to review, and with the inclusion of the Bava and Tapert (2010) study from the previous section, each of the three studies are discussed in further detail.

Bava and Tapert (2010) conducted a review of the literature related to changes taking place in the brain during adolescent development. The researchers indicate that processes in the development and maturation of the brain, including grey matter volume reductions and white matter development occur in the areas of the brain that support cognition (Bava & Tapert, 2010). Adolescents experience growth of the prefrontal cortex, structures within the limbic system, and white matter which are linked to more developed cognition skills and emotional processing. These changes are useful for functioning within a complex psychosocial environment (Bava & Tapert, 2010). Higher-order cognitive processes during adolescence are linked to frontal lobe maturation (Rubia, Smith, Brammer, & Taylor, 2003) and include development of memory, planning, problem solving, and inhibitory control (Anderson, Anderson, Northam, Jacobs, & Catroppa, 2001; Conklin, Luciana, Hooper, & Yarger, 2007).

In spite of the fact that positive cognitive changes are happening, adolescents have increased tendencies to engage in behaviors like risk-taking and reward seeking, resulting in unhealthy choices (Bava & Tapert, 2010). The researchers report that adolescents are more likely to be influenced by emotional context than their adult counterparts; this explains at least in part why adolescents tend to make poor decisions when they are in an emotionally reactive state (Bava & Tapert, 2010). Bava and Tapert (2010) conclude that rates of substance abuse are alarming and that is just one way that adolescents can make bad choices and engage in risky behaviors. This was a review of the science of neurodevelopmental processes, the influence of

substance use on neuromaturation, and factors that promote risk-taking behaviors. Information about the latter is relevant to this study because it can help focus the content of prenatal text messages to include addressing risk-taking behaviors as a way to meet adolescent educational needs.

Somerville, Jones, and Casey (2010) explored the biological basis of emotional and incentive-seeking behavior of adolescents to explain increased engagement in risky behaviors and negative and labile moods in a review article that summarized the evidence about many of the reasons for behavioral and affective changes in adolescents. The authors developed a neurobiological model of adolescent behavior based on brain changes that occur during this time. Specifically, Somerville et al. (2010) describe an imbalance between the part of the brain (amygdala and ventral striatum) that is related to emotional and incentive-based behavior being more structurally and functionally mature than the part of the brain brings about cognitive and impulse control (prefrontal cortex). The prefrontal cortex continues to function at relatively less mature levels during adolescence while having less control over the subcortical regions of the brain; this relative imbalance between the two brain systems is what can lead to the emotional and reward-seeking behaviors in adolescence (Somerville et al., 2010). Other influences are provided to explain the exaggerated reward and emotional processes of adolescence, including sex hormones and the impact of the social environment (Somerville et al., 2010).

Somerville et al. (2010) described and synthesized the evidence about adolescent incentive-driven behavior and observed that there are three main themes characterizing adolescent behavior as compared to the behavior of children and adults, namely adolescents demonstrate heightened sensitivity to environmental influences (leading to risk-taking), an inability to exert behavioral control even with important environmental cues (leading to poor

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decision-making and behaviors), heightened affective responsiveness dependent on individual differences (leading to emotionality) (Somerville, et al., 2010). The investigators concluded that the developmental stage of adolescence along with individual differences in anxiety or mood states, combined with family or peer relationships may increase risk for the intense emotions and behaviors observed during adolescence (Somerville et al., 2010). Exploring the development of adolescent decision-making related to risky and emotional behaviors can be considered relevant for the proposed study because it will be helpful to know how adolescents decide to engage in behaviors, positive and otherwise.

Reyna et al., (2011) investigated risky decision making in adolescents from two perspectives, in a classic laboratory task (the framing task) and in the context of real-life risk taking (such as having sex). The researchers explored these two perspectives as a way to test Fuzzy Trace Theory (Reyna, & Brainerd, 1995) which holds that as decision makers develop, they move further from the more precise verbatim thinking (prompted by specific cues that retrieve true memories of actual events) and closer to the fuzzier gist thinking (prompted by vague cues that retrieve interpretations of reality) when making decisions about risk and reward (Reyna et al., 2011). The researchers discussed a developmental shift from verbatim thinking (in childhood) to a greater reliance on gist thinking as decision makers develop (Reyna et al., 2011). Therefore, as the individual develops their decision-making capacity, there is less quantitative processing and more qualitative processing of risks and rewards, even though in general the individual is becoming more adept at processing information quantitatively (Reyna et al., 2011).

The Reyna et al. (2011) study included 153 participants: 102 young adults who ranged in age from 18 to 22 years old (M=19.7, SD= 0.90); and 51 adolescents who ranged in age from 14 to 17 years old (M=15.5, SD= 1.1) (Reyna et al., 2011). The adult group in the Reyna et al.

(2011) study more closely represents the ages of adolescents as defined for this proposed study. The framing task problems involved making a choice between a sure option and a gamble. The problems and participants were randomly assigned to one of two groups. The groups varied by which decisions were presented first (gain decisions versus loss decisions). The researchers performed a series of statistical analyses including ANOVA, factor analysis, and regression analysis. Inspection of the findings suggests that measures of gist-based thinking predicted real-life risky behaviors and intentions.

For adolescents, the initiation of sex and having multiple sex partners was more risky than those same behaviors in adults (Reyna et al., 2011). Examination of the findings suggests that gist-based thinking was a protective factor in the analysis of these behaviors and intentions, while verbatim thinking was associated with increased risky behavior and intentions (Reyna et al., 2011). The researchers concluded that cognitive, social, and motivational factors are involved in the decision-making processes of risk taking (Reyna et al., 2011). These findings have relevance to the proposed study because adolescents rely on fuzzier gist thinking as they develop the ability to process decisions about risks and rewards; therefore the adolescent breastfeeding decision-making process would benefit from text messages that promote fuzzier gist thinking.

Critique. The evidence for adolescent risk taking was reviewed. The Somerville et al. (2010) study was a comprehensive review of the literature in which both the attributes and the limitations of the studies (involving both human and animal subjects) were discussed. However, there was no description of the search process. Somerville et al. (2010) report limitations of the studies, including relatively few studies, many with small samples, usually just adolescents in the sample, not children, adolescents, and adults for comparison purposes, and generalized assessment of the prefrontal cortex only, as compared to its many subdivisions.

The rest of the studies were lacking in ways that might introduce bias such as self-selection of sample participants (Reyna et al., 2011). Finally, the McNeely & Blanchard (2009) guide was a comprehensive, comprehensible, and practical resource, although it was not clearly explained how the literature was searched.

Summary. In conclusion, the studies reviewed for strength of the evidence and found to be "level 3." The quality rating was "B", which means good quality with fairly definitive conclusions and recommendations based on scientific evidence. Inspection of the findings suggests that adolescents exhibit behaviors differently from children and adults with greater influence from environmental influences which may lead to increased risk taking, less control over behaviors, and increased emotionality (Somerville, et al., 2010). This information about the adolescent's developmental stage, mood states, as well as effects of social relationships will be considered when developing the prenatal text messages as one way to provide patient-centered care for this population.

Help-Seeking

Theoretical. Muuss (2006) described the adolescent population as a highly diversified and individualized group rather than a homogeneous one. McNeely and Blanchard (2009) described the adolescent years as the time during which children grow and develop into adults, becoming physically capable of reproducing, mentally able to think more abstractly, and emotionally able to feel more empathetically. This individualization occurs as a result of family and social influences that impact the ways that adolescents form their self-perceptions which in turn impacts their behaviors (DeVito, 2007) such as help-seeking.

Empirical. A review of the empirical literature was performed by using key words female, adolescent, and help-seeking behaviors. There were ten studies identified, five were

eliminated because they did not include the key words. The remaining five studies are reviewed in the following pages.

Ballon, Kirst, and Smith (2004) conducted focus groups with adolescents to explore help-seeking for substance abuse problems. The focus groups ran for 60 to 75 minutes and participants (17 males and 7 females) were between 14 and 21 years of age (no average age provided). Content analysis was used to examine the transcripts, and common themes were identified. Examination of the findings suggests that the adolescents considered barriers to help-seeking to be self-motivation, poor doctor/staff/patient relations, negative feelings and self-perceptions, family dynamics, gender aspects, societal reactions, and a lack of awareness and education related to the harms of substance abuse and types of treatments available (Ballon et al., 2004). Inspection of the findings also suggests other barriers to help-seeking included adolescent attitudes, problems accessing treatments, problems with existing treatment structure, mental health problems, age, and peer pressure (Ballon et al., 2004). The authors' conclusions were that these barriers need to be addressed to help adolescents overcome the obstacles they face when seeking help for substance abuse problems (Ballon et al., 2004). Inspection of these findings are relevant to the proposed study because they provide information about how adolescents address barriers to help-seeking for substance abuse and may provide insight into how adolescents address other barriers to other behaviors (like breastfeeding) as well.

McKee, Karasz, and Weber (2004) studied the health care seeking behaviors of 13 to 19 year olds (no median age provided) African American and Latina girls ($n= 22$) in New York City. The investigators found that before the onset of sexual activity, health care needs are met within the context of the family while after the onset of sexual activity health care seeking for reproductive health needs is most likely to be informal care seeking and lay referral. This was a

qualitative study that collected in-depth interviews. Examination of the findings suggests that key modifiers of the adolescent girls' ability to seek help for their sexual health needs and concerns include selective sharing of information that might be harmful or threaten privacy, the need for personalized care, modeled by the mother, and relationships with physicians that vary in quality and closeness. Inspection of the findings also suggests that none of the participants could meet their health needs through the relationship they had with their mother. The authors' concluded that adolescent girls' needs include privacy and a close mother-daughter relationship, and in the attempt to meet these needs, their reproductive health care was lacking. Inspection of the findings suggests that adolescents need personalized information that comes from somewhere other than their mother and meets their specific developmental needs for information about sensitive topics. This information has relevance to the proposed study because a prenatal text messaging intervention may be a developmentally appropriate way to meet an adolescent's needs for information about breastfeeding and other sensitive topics.

Barksdale and Molock (2009) used the Theory of Reasoned Action (Ajzen & Fishbein, 1980) to explore the impact that culturally relevant factors (like perceived negative peer and family norms about help-seeking) have on the help-seeking intentions of a late adolescent ($M=$19 years, $SD=$2.17) sample of African Americans ($n=$219). The authors used a cross-sectional within groups design. The participants were mostly female ($n=$144; 65.8%). Inspection of the statistical analyses revealed that family norms were a stronger predictor of intentions than peer norms for females (Barksdale & Molock, 2009). Examination of these findings suggests that an adolescent female tends to rely on family more than peers for help-seeking with mental health services. This is important information to understand about adolescents, although it cannot be directly applied to the proposed study. The Barksdale and Molock study provides support for the

Ecological Systems Theory (Bronfenbrenner, 1979) as the theoretical framework for this

proposed study because it emphasizes the need to take into consideration the individual's family

(microsystem) when exploring the factors that impact behaviors like help-seeking.

Miller et al., (2010) conducted a study on intimate partner violence (IPV) and health care

seeking behaviors using a cross-sectional survey of adolescent females ($n=448$), ages 14 to 20

years ($M=17$ years, $SD=1.7$) drawn from clinics in urban neighborhoods in Boston. Demographic

data, specific health information, as well as questions about intimate partners was collected

through self-administered, anonymous, computerized surveys. Data analyses included chi-

square, logistic regression, and descriptive statistics. Inspection of the findings suggests that the

prevalence of IPV in this sample was 42%, approximately twice as high as estimates from

community and school-based samples, and just under half the participants (45%) reported that

violence happened in their current or most recent relationship (Miller et al., 2010). The authors'

conclusions were that IPV is common among adolescents but screening by health care providers

appears low; therefore IPV screening and broad-based interventions tailored for this population

are needed. Inspection of these findings has implications for this study because just as

adolescents may not seek help about IPV, they may not seek help about breastfeeding either;

therefore providing breastfeeding information though a prenatal text messaging intervention may

meet their own health care needs as well as the health care needs of their newborns.

Martin, Houston, Mmari, and Decker (2012) conducted a descriptive qualitative study

about adolescents' experiences of dating violence, preferences for help-seeking, and thoughts

about a hypothetical teen dating violence resource center. Each of the four semi-structured focus

groups were made up of five to nine African American adolescents aged 13-24 years old, loosely

stratified by age (i.e., 13-16 years and 15-24 years) (Martin et al., 2012). The focus groups were

semi-structured, 45-60 minutes in length, audio-taped, and moderated by two female pediatricians who were experts in adolescent health. The moderators followed an iterative approach and after four focus groups saturation had been reached. Audiotapes were transcribed, reviewed, analyzed, and coded using an inductive approach. Examination of the findings suggests that teens have different ways to describe abuse and violence in dating relationships, and that they prefer to talk to friends and family over formal sources of help (Martin et al., 2012). The authors' conclusions were that this information can be helpful in determining prevention and intervention efforts to address the high rates of violence and its health impact among adolescents (Martin et al., 2012). Inspection of these findings provides support for the Ecological Systems Theory (Bronfenbrenner, 1979) as the framework for the proposed study, in that it emphasizes the influence of friends and family (the adolescent's microsystem) on the adolescent; this is important information to consider when creating the text messages.

      Critique. The evidence for adolescent help-seeking behaviors was reviewed. The Martin et al. (2012) study was limited by a convenience sample of adolescents from a single urban setting and a single ethnic group. In this study, the use of slang terms decreased generalizability as interpretation of their meaning can vary by both geographic area and demographic group. The Miller et al. (2010) study employed a cross-sectional design using self-report of IPV experiences which may introduce bias in assessment. In addition, the participants from the Miller et al. study are drawn from a single metropolitan area with a diverse population and low income levels. In the McKee et al. (2004) qualitative study, the interviews were not audiotaped and about one-third of the sample participants were self-selected. The McKee et al. sample was also small. The Ballon et al. (2007) study themes were identified but it was difficult to tell if was the participants or the focus group facilitators who identified them. In addition, when the themes were identified,

they were interrelated and it seemed that it was hard for the researchers to categorize them resulting in over-representation of certain themes. Barksdale and Molock (2009) used a cross-sectional design for their study with a decreased ability to determine cause and effect, as only negative norms were examined.

Summary. In conclusion, the evidence from the studies reviewed provided information about how adolescents may or more likely may not seek help for different health concerns. The strength of the evidence was determined to be "3", while the quality rating of the scientific evidence was "C." There were many qualitative studies and insufficient sample sizes which resulted in a lack of consistency in results and an inability to draw conclusions about the evidence.

Social Relationships

Theoretical. A basic assumption of theories of adolescent development is that the influence of parents lessens over time (Muuss, 2006; Cooper & Guthrie, 2007). Gradually throughout adolescence, peer relationships gain importance, and new friendships and social networks are formed (McNeely & Blanchard, 2009). On the whole, adolescents are more sensitive to social cues as compared to adults, especially when those cues are from their peers (Somerville et al., 2010). As peer relationships become more important in adolescence, the potential for rejection by peers (and the associated negative consequences) increases (Sebastian, Viding, Williams, & Blakemore, 2010). Identity development is an important task of adolescence, a complex process that requires interactions and relationships to significant others (Kruse & Walper, 2008).

Adolescents are influenced by the behaviors in which their social groups engage, including smoking, drinking, or having sex (McNeely & Blanchard, 2009). Inspection of the

evidence also suggests that the determinants of healthy identity development in adolescent girls are strong parental and peer attachment bonds (Nawaz, 2011). Understanding how adolescents are influenced by parents and peers is important to learning the ways in which their identities form. It is important to recognize that becoming a mother has the potential to cause social adjustment problems for the adolescent and negatively impact the developmental processes of mother and baby alike (Beers & Hollo, 2009). An adolescents' developmental stage impacts her self-perception both as a mother and as a person, and influences her social relationships as well (Nesbitt et al., 2012).

Empirical. A review of the literature was performed by searching with key words female, adolescent, and social relationships. Sixteen studies were identified. One study was eliminated because it dealt with adolescents with juvenile idiopathic arthritis. Another was eliminated because it addressed peer status at age 13 and subsequent smoking at 32 years old. Several studies were eliminated because they were from countries other than the United States (Argentina, Sweden, etc.) A few studies were eliminated because the information they provided was not relevant to this study. Seven studies were reviewed and will be discussed in greater detail.

Mackrell and Lavender (2004) explored adolescent psychosis and social relationships using grounded theory (Strauss & Corbin, 1998) with semi-structured interviews and open-ended questions, asking "who was important to you?" The same format was used to elicit perceptions of relationships during childhood, early adolescence, later adolescence, and after the onset of psychosis (Mackrell & Lavender, 2004). The sample was composed of twelve participants between the ages of 16 and 30 years (no means or standard deviations were provided) who had diagnoses of psychotic disorder, schizophrenia, polymorphic disorder, or bipolar disorder with

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psychotic symptoms (Mackrell & Lavender, 2004). The researchers explain that they used a wide range of ages because of the following two reasons: adolescence was defined using a cultural understanding, as the extended transition period to a secure place in the adult world (Dartington, 1995); and their research also considered the theory that the onset of psychosis is associated with blocked adolescence (Harrop & Trower, 2001).

Mackrell and Lavender (2004) described adolescence as a period of change in self and in relationships with others. The adolescent's peer network was described as an important part of this time of life, in which the adolescent becomes more independent from family and more dependent on relationships with peers in small groups or dyads (Mackrell & Lavender, 2004). Examination of the findings related to the participants' descriptions of their relationships suggests that unstable peer relationships in childhood tended to develop into unstable social relationships in adolescence. Inspection of the Mackrell and Lavender (2004) findings suggests that before the late adolescents' psychotic episodes, participants were becoming isolated from peers. But the researchers explain that after the psychotic episode they felt even more isolated (Mackrell & Lavender, 2004). The researchers' conclusions were that there is a need to develop intervention programs and services to assist at-risk individuals address negative peer relationships as well as maintain peer relationships after a psychotic episode (Mackrell & Lavender, 2004). This study cannot be directly applied to the proposed study, but the findings may provide support for the idea that pregnant adolescents may face negativity in peer relationships and feel isolated from their peers.

Callaghan (2006) explored the influences of certain conditioning factors on healthy behaviors in a secondary analysis of a previous study (Callaghan, 2005). Self-efficacy beliefs and self-care among adolescents were examined using Pender's Health Promotion Model

(Pender, Murdaugh, & Parsons, 2002), Bandura's (1997) Social Cognitive Theory and Orem's (2001) Self-Care Deficit Nursing Theory. The data were collected from the convenience sample of adolescents (*n=256*) from a New Jersey high school aged 14 to 19 years (no means or standard deviations were provided). Examination of the findings suggests the importance of a support system to an adolescent's healthy behaviors, self-efficacy, and self-care. The authors' conclusions were that this information can be used in adolescent health by assisting high school students and families meet basic health needs by using available social support systems (Callaghan, 2006). This supports the use of the Ecological Systems Theory (Bronfenbrenner, 1979) as a framework for the proposed study because of the emphasis on social support.

Cooper and Guthrie (2007) used an ecological framework to explore how family, peer, and neighborhood factors influence African American adolescent girls' health behaviors. The researchers used a nonrandom network-sampling technique to collect data on 137 African American adolescents from the Midwest or Northeastern United States. The age range was 12-18 years (*M=15.68* years, *SD=1.61*) which was younger than the participants in the proposed study; however, it was included because of the applicability of the ecological framework. Data analyses for the Cooper and Guthrie (2007) study included univariate and bivariate analyses, multiple linear regression models, and logistic regressions. Examination of the findings suggests that both health-promoting and health-compromising behaviors of African American adolescents are influenced by the context of their social and familial relationships (Cooper & Guthrie, 2007). Inspection of the findings also suggests that supportive family relationships are associated with less substance use, risky sexual behaviors, and problem behaviors (Cooper & Guthrie, 2007). The authors' conclusions were that this information helped explain the importance of the social and relational contexts of African American adolescent girls and their health behaviors (Cooper

& Guthrie, 2007). The Cooper and Guthrie (2007) study supports the use of the Ecological Systems Theory (Bronfenbrenner, 1979) in adolescent health promotion strategies by incorporating social relationships.

Beets, Pitetti, and Forlaw (2007) examined the role of social support and self-efficacy on physical activity among adolescent girls in rural areas. The sample was drawn from the physical education classes of one Midwestern high school (*n*=259). The average age of the participants was 15.5 years ± 1.2 years, which was younger than the participants of the proposed study but it was included because of the emphasis on social support and its role in positive health behaviors. The authors used structural equation modeling to test the relationships between physical activity, social support for physical activity from parents and peers, and self-efficacy for overcoming barriers, seeking support and resisting competing activities. Inspection of the findings suggests that the effect of peer social support on physical activity was partially mediated through overcoming barriers, the effect of support seeking on physical activity was mediated through peer social support to overcoming barriers, and neither parent influenced physical activity (Beets et al., 2007). The authors' conclusions were that peer social support and dimensions of self-efficacy are important to adolescents and should be considered in intervention studies (Beets et al., 2007). This supports the idea that social support plays a role in adolescent health behaviors and may be an important consideration for development of the prenatal text messaging intervention.

Taylor-Seehafer et al. (2007) explored social connectedness, social support, and sexual health behaviors among a nonprobability sample of homeless youth (176) in a descriptive study that was a secondary analysis of a larger intervention study. The ages of the participants were 16 to 20 years (*M*= 18.5 years of age, *SD*= 1.2). Data were collected with self-report measures and

analyzed with correlations, path analysis, and multivariate analyses of variance. Examination of the findings suggests that social connectedness and social support were correlated, but only social support was correlated with sexual self-concept (Taylor-Seehafer et al., 2007). The authors' conclusions were that the social group with which the homeless adolescents identify may provide a resource for them in the form of sexual behavior mentoring (Taylor-Seehafer et al., 2007). This information supports the idea that an adolescent's social group may act as a resource for them in the form of breastfeeding support.

The researchers of the National Longitudinal Study of Adolescent Health examined protective factors on the health and well-being of 36,000 adolescents (Centers for Disease Control and Prevention (CDC, 2009). Investigators found that family, school, and individual factors (school and family connectedness, high parental expectations for academic success, and the student's involvement in religious activities) were protective against a range of negative health behaviors (CDC, 2009). Inspection of the evidence suggests that school connectedness is the strongest protective factor for both boys and girls in decreasing substance abuse, absenteeism, early sexual initiation, violence, and risk of injury (due to drinking and driving, not wearing seat belts, etc.). The findings also suggest that after family connectedness, school connectedness ranks highest as a protective factor against emotional distress, eating disorders, and suicide (CDC, 2009). Inspection of the findings suggests that the adolescent's protective factors will vary according to the context of her environment, which may have an impact on her breastfeeding decision-making capacity.

Teitelman, Bohinski, and Boente (2009) explored adolescent girls' perspectives about the social aspect of where they learn about sex, sexuality, and relationships. The ages of the participants were 14-18 years of age, with no mean or standards deviation provided; however,

the researchers report a higher proportion of 15 year olds and fewer 18 year olds. The sample (33) was drawn from an urban area in southeastern Michigan using selective sampling to ensure representation from the two major population groups, African American and Euro-American. Open-ended questions were used in interviews that explored their sexual orientation (heterosexual-24, lesbian-0, bisexual-1, open to possibilities-6, questioning-1, and missing-1). Inspection of the findings suggests that the most common sources for learning about sex, sexuality, and relationships identified by girls in the study were: family, friends/peers, partners, school, and the media (Teitelman et al., 2009).

Family members served as an initial source of the information adolescents received about sex, sexuality, and relationships, while peers were the source of information about slang terms and non-intercourse sex (Teitelman et al., 2009). Health care providers were viewed as a resource for contraception or reproductive tract infections, but not sexual health issues (Teitelman et al., 2009). In conclusion, the adolescent girls in this study found their families to be initial resources for information about sex. As far as friends/peers, partners, school, and the media were concerned, Teitelman et al. (2009) report that the resources provided were limited, and social pressures related to sexual behaviors strong. This resulted in a conflict of information in messages received by adolescent girls related to sex, sexuality, and relationships leaving the adolescent girls often struggling to process their feelings about the subject (Teitelman et al., 2009). This supports the need for the development of a prenatal text messaging intervention that can provide straightforward information about prenatal topics, including breastfeeding, to adolescents who may be overwhelmed and confused by the conflicting information available to them.

Critique. The evidence for adolescent social relationships was reviewed and limitations of the studies were identified. Callaghan used a measure called the Exercise of Self-Care Agency Scale (Kearney & Fleischer, 1979) in which the subscale passivity was below .70; therefore, significant results should be carefully interpreted. In the Taylor-Seehafer et al. (2007) and Beets et al. (2007) studies some of the data were drawn from adolescents' self-reports, therefore, there might be some systematic bias. In the Mackrell and Lavender (2004), Taylor-Seehafer et al. (2007), and Beets et al. (2007) studies the samples were small; therefore, the findings cannot be generalized to a wider population. In the Cooper and Guthrie (2007) study the authors reported that ecological factors were associated with health behaviors, but the connection between family, peer, and community characteristics and long-term health behaviors was not made clear.

Summary. In conclusion, the studies related to adolescent social relationships were reviewed. The strength of the evidence was determined to be mostly "3" with two studies considered "2." The quality rating was determined to be mostly "C" with two studies determined to be "B." The information provided by these studies was reasonably consistent in reporting that social relationships are important to adolescents, but because of the low quality conclusions cannot be drawn. Still, the information may be useful in planning a text messaging intervention by incorporating the people who are most important in the adolescent's life, namely friends and family, in ways such as suggesting they accompany the adolescent to a breastfeeding class, etc.

Communication

Theoretical. An impressive majority of all American adolescents (84%) own at least one of the following: a computer, a cell phone, or a Personal Digital Assistant (Lenhart et al., 2005). In addition, 44 percent of these adolescents report that they have two or more devices, while only 16 percent of all adolescents report that they do not have any of these devices at all (Lenhart et

al., 2005). The Pew Research Center's Internet & American Life project provides information on the issues, attitudes and trends shaping America and the world, exploring the impact of the Internet on many different aspects of American society through administration of surveys (Lenhart et al., 2010a; 2010b). Inspection of the findings suggests that the numbers of American adolescents using text messaging each day has increased in recent years, with that medium becoming the preferred way that they communicate with their friends, surpassing face-to-face contact, email, instant messaging, and voice calling (Lenhart et al., 2010a). This rapid rise in the numbers of adolescents that use text messaging means that 72 percent of all American adolescents are now texting, up from 51 percent in 2006 (Lenhart et al., 2010a). Texting is an important element of adolescent identity, and more than any other group adolescents have mastered texting to fill a communication need in their lives (Lenhart et al., 2010a).

Empirical. A review of the literature was performed using key words female, adolescent, and preferred forms of communication. There were seven studies identified, two addressed cyberbullying which was beyond the focus of this study and one was a duplicate addressed in a different section. One was from Korea, and one was not relevant to adolescent communication. Two studies were reviewed and will be discussed in greater detail.

Wisdom and Green (2004) used a modified grounded theory approach and a purposive sample of 7 adolescents (5 females and 2 males) in Oregon and Washington state who were 15-year-old high school sophomores (no standard deviation provided,) to explore how adolescents with depression experience the disease and interpret their medical diagnosis in focus groups. Data were also collected through interviews of participants (*n*=15, 8 females and 7 males) recruited from a local health maintenance organization. The interview consisted of questions that focused on participants' perceptions of the reasons for their depression, when to seek professional help, and how they made sense of their depression. Themes were identified through

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an iterative process and data were examined through a constant comparative analysis. The authors' findings suggest a theoretical scheme based on adolescents' communication of their experiences progressing in a chronological order from distress, to being in a funk, to consideration of whether they were depressed. Adolescents who received a depression diagnosis considered their feelings and choices and attempted to make sense of their depression. The authors' conclusions were that adolescents describe and express their depression experience, communicating and conceptualizing it in ways that impact their attitudes and decisions about how and when to seek professional help (Wisdom & Green, 2004). The findings suggest that adolescents may need help in identifying and communicating the need to seek help which has implications for the creation of text messages in the proposed study.

Jaskiewicz (2009) conducted an integrative review on the primary health care needs of female adolescents and eleven quantitative studies met the criteria for inclusion. For the purposes of the proposed study, the findings related to communication are presented. Jaskiewicz (2009) found that female adolescents typically encounter a lack of communication with their health care provider about the issues that are being faced (Jaskiewicz, 2009). Inspection of the findings suggests that for the female adolescent population it is imperative that a strong adolescent/provider relationship be established through therapeutic communication. Jaskiewicz (2009) suggests that further efforts should focus on qualitative research of adolescents and providers perceptions of communication barriers because the female adolescent population is typically difficult with which to communicate. The proposed study will provide adolescents with text messages offering communication about pregnancy and breastfeeding, which may prove a viable option for this population who is challenged to communicate in person with their health care providers.

Critique. In summary, the evidence for adolescent preferred forms of communication was reviewed and limitations of the studies are identified here. Wisdom and Green (2004) used a very small sample, so further studies are necessary with other ethnic and sociodemographic groups to be able to enhance transferability of findings. In the Jaskiewicz (2009) integrative review limitations of the findings were that they were not generalizable due to the narrowly defined age category. In addition, there were only eleven studies which met the inclusion criteria.

Summary. In conclusion, the studies related to adolescent preferred forms of communication were reviewed. The strength of the evidence was determined to be "3" and the quality rating of the scientific evidence was "C." In general the evidence supports the idea that adolescents prefer electronic forms of communication. Considering the fact that female adolescents find communicating with their health care providers challenging, and that electronic forms of communication are preferred by adolescents, the development and use of a prenatal text messaging intervention may be supported.

Literacy

Theoretical. According to the National Assessment of Educational Progress, 27% of 12th grade students scored below the basic reading level in reading; the exploration of these findings suggests that substantial numbers of adolescents cannot comprehend or evaluate the written word, understand important concepts, or infer meaning about the written documents they read (Alliance for Excellent Education, 2011).

Gazmararian, Curran, Parker, Bernhardt, and DeBuono (2005) examined health literacy in the United States and inspection of the findings suggests that over one third of the American public struggles with understanding the communication of health topics. This issue poses a real challenge for public health agencies, health organizations, and health professionals. Gazmararian

et al. (2005) describe a general lack of appropriate skills needed by the American public to navigate through the myriad of health information available, and recognize that many factors are involved in this problem. Two particularly important factors identified as negatively impacting health literacy include educational materials written beyond the reading comprehension of the health care consumer and the growing reliance on technology in health communications in the U.S. (Andrus & Roth, 2002; Gazmararian et al., 2005). The Gazmararian et al. article was not focused on adolescents, but has relevance for this study because the adolescent participants will undoubtedly present with different reading levels and different abilities in understanding health information. Therefore, the text messages and consent documents for the proposed study must be designed at a level that the average adolescent can understand.

Empirical. A review of the scientific evidence was performed by searching the literature using key words female, adolescent, and literacy level. Eight studies were identified; five studies were eliminated because the samples were not applicable to the proposed study. The remaining three studies were reviewed and each is discussed in further detail.

Davis et al. (2006) conducted a study to validate a brief screening tool for word recognition to be used with adolescents in health care settings. The Rapid Estimate of Adolescent Literacy in Medicine (REALM-Teen) (Davis, Long, & Jackson, 1993) showed excellent internal consistency based on Cronbach's alpha, and test-retest reliability. Criterion validity was established with correlations with both the Wide Range Achievement Test-Revised (Wilkinson & Robertson, 2006) and Slosson Oral Reading Test-Revised (Slosson, 1991). The sample ($n=1533$) consisted of adolescents aged 10-19 years old from Louisiana and North Carolina; data collection included face-to-face interviews, demographic information, and reading tests. Five reading level categories were identified: 3rd grade and below; 4th to 5th grade; 6th to 7th grade; 8th

to 9th grade; and 10th grade and beyond. Inspection of the findings suggests that 46% of participants were reading below their grade level and 28% had repeated at least one grade (Davis et al., 2006). The authors' conclusions were that the REALM-Teen is a reliable measure of adolescent literacy skills and reading below grade level (Davis et al., 2006). This study provides support for the idea that it cannot be assumed that the literacy skills of the intended recipients of any intervention requiring the use of reading skills (including text messages) will match the reading level of their chronological age. The reading level then of the text messages and consent documents for the proposed study may need to reflect a readability in the middle school (grades 6-8) range.

Cope, Morrison, and Samuels-Reid (2008) searched the literature for adolescent insulin and patient-controlled analgesic pump-related adverse events reported by the Food and Drug Administration database from 1996 to 2005. A total of 1674 reports were identified; 1594 were related to insulin pumps, and 102 (16.4%) were able to identify factors which at least contributed to the event, in some cases tampering and noncompliance were a factor (Cope et al., 2008). Some of the potential reasons for adolescent problems with insulin pumps were related to education: specifically, the adolescent was not sure about how to work the device and in particular did not know how to troubleshoot when problems arose (Cope et al., 2008). The researchers do not identify from what aspect of education may potentially have been the problem. It is possible that the problem may have been miscommunication, inadequate communication, or literacy among other things. The authors' conclusions were that adolescents need support in the decision to use device technology and careful consideration of risk versus benefit factors (Cope et al., 2008). This reinforces the idea that a prenatal text messaging intervention needs to communicate clear concise and accurate information that adolescents can understand and use appropriately.

Gonzalez, Penelo, Guiterrez, and Raich (2011) used a quasi-experimental design with prospective follow-up (at 7 and 30 months) to evaluate the long-term impact of a school-based adolescent eating disorder program. The sample consisted of 443 Spanish adolescents of both genders (M=13.5 years, SD=0.4) assigned to one of three possible experimental conditions (control- n=201; media literacy- n=143; media literacy plus nutritional awareness- n=99). Data were collected using the pretest, posttest, and follow-up measures with the Eating Attitudes Test (Garner & Garfinkel, 1979), Questionnaire on Influences of Aesthetic Body Ideal-26 (Toro, Castro, Gila, & Pombo, 2005; Toro, Salamero, & Martínez, 1994), as well as body mass index. Examination of the findings suggests that the participants from both prevention programs scored lower on both measures as compared to the control group participants at follow-up assessments (Gonzalez et al., 2011). The authors' conclusions were that both the media literacy and combined media literacy and nutritional awareness programs are effective ways to address disordered eating attitudes and internalization of the aesthetic body ideal in a sample of adolescents (Gonzalez et al., 2011). Gonzalez et al. does not directly discuss adolescent literacy but the study was included here because it addresses prevention and intervention programs that may be used with adolescents, and how adolescents may use and learn from media communication to promote messages of health within their social environments (like at home and in school) (Neumark-Sztainer, 2009: Neumark-Sztainer et al., 2006; Neumark-Sztainer et al., 2007; Neumark-Sztainer et al., 2009; Neumark-Sztainer, Story, Hannan, & Rex, 2003).

Critique. The literature on adolescent literacy was reviewed and there were limitations noted in the studies. In the Gonzalez et al. (2011) study when the researchers collected data at the 30 months follow-up 37.7 percent of the participants were missing, which requires careful interpretation of the results. Another factor to consider is that randomization occurred at a school

level which is not considered as effective as the individual or class level. Davis et al. (2006) examined the REALM-Teen instrument and reported that it can only detect low literacy, not specific grades like other tests can; in addition, it cannot diagnose the type of learning problems or deficiencies. One more consideration with REALM-Teen is that it is only available in English as it cannot be used in phonetic languages like Spanish (Davis et al., 2006). Cope et al. (2008) report that because most of the information about adverse events was provided by manufacturers, the accuracy of the information may be subject to bias, may be subjective and/or may be imprecise. The authors also report that there was insufficient information about patient demographic factors and history with which to understand incidence rates of adverse events (Cope et al., 2008).

Summary. The evidence related to adolescent literacy was reviewed. While the information did not address adolescent literacy specifically in the Cope et al. (2008) and Gonzalez et al. (2011) studies, the evidence was reasonably consistent in demonstrating that adolescents like any age group, read and understand information at different levels. This has application to the proposed study because the creation of text messages and consent documents must take into consideration the wide variation in reading levels of participants when planning interventions and education for this population. While the information that was provided in the studies was based on scientific evidence, it does exhibit some risks for bias and inaccuracies and therefore the strength of the evidence was determined to be "2" and "3" and the quality rating was "B" and "C."

Technology

Theoretical. According to Skinner et al. (2003), adolescents use technologies in four main ways: by personal communication, such as telephone, cell phone, and pager; social

communication, mainly e-mail, instant messaging, chat, and bulletin boards; interactive environments such as Web sites, search engines, and computers; and one way sources such as television, radio, and print. Adolescents aged 18 to 19 are members of the "Millennial Generation", those individuals born between 1981 and 1995, also known as Generation Y (Oblinger & Oblinger, 2005). Prensky (2001) considers adolescents digital natives because they have always had technology in their lives, and as such have more than embraced a wired world. The Pew Internet and American Life Project researchers refer to the Millennial Generation as the "always-connected" generation (Bull, 2010; Lenhart et al., 2010). Westerman (2006) describes the adolescent population as one that takes technology for granted, a group that is accustomed to instant gratification through means of cell phones for communication, the Internet for information, video games for amusement, and Facebook for socializing.

Empirical. A review was performed by searching the literature using key words female, adolescent, and technology skills. Ten studies were identified and several were eliminated because they were not applicable to the proposed study for a variety of methodological reasons. Therefore, two studies were reviewed and are discussed in further detail.

Rhee, Wyatt, and Wenzel (2006) explored the learning needs and Internet use preferences of adolescents with asthma in a qualitative study that used focus group interviews. The focus groups were organized by gender and age: ages of the participants in the focus groups were 12-15 and 16-18 years old. Thematic analysis was performed using participants' statements, field notes, and transcripts (Rhee et al., 2006). Examination of the findings suggests that participants identified asthma learning needs for others, including peers, teachers, and parents, as well as the importance of support, socialization, and information-sharing with other adolescents having the disease (Rhee et al., 2006). The authors' conclusions were that adolescents may benefit from

intervention strategies in early adolescence that incorporate peers, and that the Internet may have potential as an intervention to manage adolescent asthma (Rhee et al., 2006). This has important implications for the proposed study because of the support it lends to using the Ecological Systems Theory (Bronfenbrenner, 1979) with its emphasis on incorporating peers into adolescent intervention strategies.

Divecha, Divney, Ickovics, and Kershaw (2012) examined how adolescents and young adults use new media technologies to communicate about sexual health. Divecha et al. (2012) report that smartphone usage has increased Internet access to health information, with 29% percent of 19-29 year olds having used their smartphone to access health information and 15% having downloaded a health application to their smartphone to help manage their health needs. The sample consisted of low-income, parenting adolescents and young adults (n=94, M=20 years old, SD=3.4) recruited from clinics in Connecticut (Divecha et al., 2012). Data collection consisted of computer-based audio self-reports of media technologies, communication with friends about sexual health, and willingness to use media technologies for communication about sexual health. Descriptive statistics, chi-square, t, and Mann-Whitney tests were used for data analysis. Inspection of the findings suggests that 93% of participants had a mobile phone and 71% used Facebook regularly; however, participants communicated about sexual health more often in person with close friends (71%) than with casual friends (68%), instead of over the phone (52% close friends; 45% casual friends), via text messages (30% close friends; 28% casual friends), or through social networking sites (0–9% close friends; 2–7% casual friends) (Divecha et al., 2012).

Divecha et al. (2012) concluded that due to the sensitive nature of the topic of sexual health, adolescent and young adult urban parents choose more private methods of

communication; therefore, social networking sites may not be a preferred means of providing STD interventions. This study does not have direct application to the proposed study, but it does provide information that adolescents use mobile phones, text messaging (at least to some degree), and peers as support for sexual health concerns. This proposed study will seek to determine to what degree adolescents find prenatal health topics and breastfeeding amenable to the text messaging format as well.

Critique. The literature was searched, studies about adolescents and technology were reviewed, and limitations were identified. Divecha et al. (2012) acknowledged some limitations in their study, namely participants were from one socioeconomic group (low-income) and were parents; therefore the participants in this study do not represent all adolescents and young adults. The Divecha et al (2012) study used self-report data which may not have been completely accurate. Rhee et al. (2006) used a small sample size, but considering this was a qualitative study, understanding the concepts is the priority over the ability to generalize findings. In the Rhee et al. study participants were self-selected which may result in bias and may have felt the need to answer in the ways that researchers expected them to, demonstrating social desirability bias (Rhee et al., 2006). Data collection in the Rhee et al. study may have been negatively influenced by group dynamics, with certain members controlling the discussion and others unable to provide their thoughts.

Summary. In spite of these limitations discussed above, the information that was provided demonstrated some control and fairly consistent results while exhibiting some risks for bias and inaccuracies; the quality rating is "B." The studies were determined to be "2" and "3" for having some threats to validity (particularly selection) and being explorative in nature. The evidence provided useful information for the purposes of this study in reporting that adolescents

are comfortable with technology in its many forms, they use technology well, and they prefer it as a means of communication with their peers. This lends support for the use of text messaging as an intervention to educate and inform adolescent mothers in topics related to pregnancy and breastfeeding.

Text Messaging

Theoretical. Adolescence is a challenging time in which biological, psychological, and social changes are occurring rapidly. McNeely and Blanchard (2009) state that context, or the environment in which a child is brought up, is also an important aspect of adolescent development. Bronfenbrenner (1979, 1995, 2005) and McNeely and Blanchard (2009) describe the environment broadly, as the places where adolescents spend time including home, school, work, and neighborhood, including influences like media sources. Cell phones can be considered as an aspect of an adolescent's environment, and have been proven to be an effective way to meet the needs of adolescents while they work toward achieving independence (Lenhart et al., 2010b).

"Wireless communication has emerged as one of the fastest diffusing media on the planet, fueling an emergent "mobile youth culture" that speaks as much with thumbs as it does with tongues" (Lenhart et al., 2010a, p. 9). The importance of cell phone technology to adolescents cannot be overemphasized; however, while many adolescents are adept at text messaging, it cannot be ignored that an important segment of this population are not. One-fifth of adolescents, or 22%, send and receive just one to 10 texts a day, or 30 to 300 texts a month (Lenhart et al., 2010a). According to the Pew Internet and American Life Project (Lenhart, 2012), 63% of all teens say they engage in text messaging every day, which reflects an increase in frequency as compared to using other forms of communication, "including phone calling by cell phone (39% do that with others every day), face-to-face socializing outside of school (35%),

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social network site messaging (29%), instant messaging (22%), talking on landlines (19%) and emailing (6%)" (Lenhart, 2012, p.2).

Text messaging suits an adolescent's lifestyle. It is a means of communication that is fast-paced, provides ready access to social contacts, and is relatively inexpensive to use (Bryant et al., 2006). According to Lenhart et al. (2010a), 75 percent of adolescents are subscribed in unlimited text messaging plans. In conclusion, text messaging is a preferred method of communication among adolescents and may provide an efficacious way for nurses and other health care providers to communicate health education.

Empirical. A review of the literature was performed. Eleven reports of studies were identified and several were eliminated because they were not relevant or applicable to the proposed study. The three remaining reports of studies were reviewed and are discussed here in greater detail.

Newton, Wiltshire, and Elley (2009) investigated whether pedometers and text messaging increase physical activity in a sample (78) of type 1 diabetic adolescents (M=14.4 years old, SD= 2.37). The authors used a randomized controlled trial design and two groups: the intervention group used a pedometer and received text messages to motivate them; the control group used usual care practices (Newton et al., 2009). The outcomes were daily step counts and a physical activity questionnaire. Inspection of the findings at twelve weeks suggests that for the intervention group: the mean daily step count decreased by 840 and physical activity increased by 38.5 minutes/week (p=0.4); while in the intervention group the mean daily step count decreased by 22 and physical activity increased by 48.4 minutes (p=0.9) (Newton et al., 2009). The authors' conclusions were that pedometers and text messages did not motivate adolescents with type 1 diabetes to increase physical activity (Newton et al., 2009). This study was included

here although the mean age of participants was younger than the ages for the proposed study because it provided information that was applicable. The authors' conclusions that text messages did not motivate adolescents to engage in positive health behaviors may prove to be an issue for this proposed study as well.

Lau, Lau, Wong, and Ransdell (2011) performed a systematic review of the evidence from randomized controlled trials related to children (aged 6-12 years old) and adolescent (13-18 years old) physical activity interventions using the Internet and mobile phones. The search used Medline, PsycInfo, CINAHL, and Web of Science databases to identify nine studies that met the search criteria and examination of the findings suggests: 7 studies reported positive and significant within-group differences in physical activity outcomes; 3 studies reported positive and significant between-group differences favoring the information and communication technologies group. When the studies were compared, 7 had good methodological quality. The authors' conclusions were that there exists evidence supporting information and communication technologies interventions in positively impacting physical activity children and adolescents (Lau et al., 2011). This was a high-quality review that provides important information for anyone developing or implementing text messaging interventions for adolescents such as this proposed study.

Allen (2012) used mixed methods to explore text messaging as a source of bullying among adolescents in a suburban United States high school; the students' and staffs' perceptions of how much hostile adolescent text messaging occurs in a United States' high school (data collected using anonymous surveys); and how students and staff view adolescent text messaging as social conflict, aggression, and bullying (data collected using focus groups and interviews). The sample size for the survey portion of the study was 820 students and 77 staff members; the

sample size for the student interviews or focus groups was 68, while the sample size for the staff interviews was 38 (Allen, 2012). The student participants' ages were 14 to 19 years old (M=16.0 years, SD= 1.23) (Allen, 2012). Examination of the findings suggests that text messaging plays an important role in the perceptions of adolescent students and staff regarding conflict, drama, and bullying, and that as a preferred form of communication it is an important way that adolescents relate and respond to each other, sometimes aggressively (Allen, 2012). The authors' conclusions are that the social practice of texting contributes to adolescents' perception of conflict and drama, which may in turn contribute to bullying (Allen, 2012). While the main reason for investigating text messaging in this study was to explore how it can be a source of bullying, the information still has some, if limited, relevance to this study because it supports the importance of text messaging as a preferred means of communication among adolescents and their peers.

     Critique. A review of the literature was performed by searching for scholarly articles using key words female, adolescent, and text messaging; the studies were reviewed and limitations were identified. Allen (2012) reported a number of limitations, including two that limited generalizability: the students who were interviewed and were members of the focus groups were self-selected; the high school did not represent most high schools in the United States. Allen (2012) also points out that as fast as technology is changing and as quickly as adolescents are adapting to these changes, the data collected in this study may become outdated very quickly. Lau et al. (2011) and Newton et al. (2009) collected data related to adolescents' perceptions which were self-reported and often interpreted as observations which may be subjective and at risk for bias. Lau et al. (2011) reported that in the systematic review there were

a relatively small number of studies that met inclusion criteria and some inconsistencies among the results which warrants cautious interpretation of the findings.

Summary. The evidence related to adolescent text messaging use was reviewed. The Lau et al. (2011) study was deemed to have an "A" quality rating in spite of the small number of studies available. The Lau et al. review provided evidence that adolescents prefer communicating by text messaging and that text messaging is an intervention that can positively impact health and wellness, specifically physical activity in children and adolescents. The other studies were determined to be a "level 3" for strength of evidence and have a "B" quality rating with reasonably consistent results and some methodological issues.

Summary of Adolescent Factors Influencing Health Behaviors

Differences exist in the physical, emotional, and cognitive domains of an adolescent's development. These differences are reflected in the adolescent's decision-making process and their ability to move from being a member of a family to member of society. Adolescent identity development and independence is accomplished through changes in their relationships with a greater emphasis on peer relationships and a lesser emphasis on parental relationships. Adolescents prefer to communicate using technology, especially text messaging, and these means of communication may prove useful in planning health education interventions. While this section explored how having knowledge of adolescent development is important to understanding their physical, emotional, and cognitive domains, as well as how that information can be used to design interventions, the following section will explore how adolescents are typically educated in health-related topics.

<center>**Adolescent Use of E-Health and M-Health**</center>

The different ways that adolescents use e-Health and m-Health, particularly text messaging will be explored in the following section.

E-Health

Theoretical. The term e-Health is described in a number of different ways. Reguly (2009) used the term e-Health to describe "healthcare practices supported by electronic processes and communication, primarily the computer and the internet" (p.17). Crean (2010) describes e-Health as the use of information and communications technologies to improve health systems performance. Al-Shorbaji and Geissbuhler (2012) define e-Health as "the cost-effective and secure use of information and communication technologies in support of health and health-related fields" (p. 322). The World Health Organization defines e-Health as the use of information and communication technologies (ICT) for health, including but not limited to treating patients, conducting research, educating the health workforce, tracking diseases, and monitoring public health (WHO, 2014a). In describing the term e-Health, it is clear that it may not be used consistently, but usually refers to a range of services that intersect with medicine, healthcare, and information technology (Reguly, 2009).

The Healthy People 2020 report contains several specific objectives that relate to health communication (HC) and health information technology (HIT). Health Communication/Health Information Technology (HC/HIT)- 6.3 addresses increasing the proportion of Americans who use mobile devices from a baseline of 6.7% of Americans in 2007, to the target goal for 2020 of 7.7%, according to the USDHHS the target setting method reflects an increase of 10% (USDHHS, 2012). According to the CDC (2009), among teens, adults (ages 25 to 34), and those 55 and older, the use of mobile Internet applications is increasing faster than other age groups

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(CDC, 2009). The Pew Internet and American Life Project (Lenhart et al., 2010) reported that late adolescents and young adults (18-29) use mobile data most often, with older adults not far behind. Moreover, compared with data from 2009, cell phone owners are significantly more likely to use their mobile device to send text messages, access the Internet, take pictures, record videos, use email or instant messaging, and play music. In particular, 95% of 18-29 year olds use the text messaging feature on their phones (Pew Internet and American Life Project, 2010). Inspection of these findings provides some evidence of the importance of cell phone use to the adolescent population.

Borzekowski (2006) calls the Internet a "controversial, coming of age resource" (p. 205). The developmental process of adolescents attaining independence is fostered by their ability to use the Internet and technology; in the process of acquiring and using health information, adolescents can promote healthy life choices and decision-making for the rest of their lives (Skopelja, Whipple, & Richwine, 2008; Vargas, 2005). In the Pew Internet and American Life Project the adolescent process of transitioning from dependence to independence was examined, and inspection of their findings suggests that 31% of adolescents use the internet to get health information online (Lenhart et al., 2005). This represents about 6 million adolescents and an increase of 47% in the number of adolescent Internet users since 2000 (Lenhart et al., 2005). Gray, Klein, Noyce, Sesselberg, and Cantrill (2005) and Skopelja et al. (2008) point out that while the Internet is an important way to educate and provide health information, many adolescents do not possess the search skills to find, not to mention the health literacy skills to understand, the information they need. It also cannot be assumed that all adolescents have access to high speed Internet, necessary to meet their health information needs (Vargas, 2005).

Empirical. A review of the literature was performed by using key words female, adolescent, and e-Health. Five studies were identified; three were eliminated because they were not from the United States; therefore, two studies are discussed in greater detail.

Christensen, Reynolds, and Griffiths (2011) conducted a review of the literature related to the use of e-Health applications for anxiety and depression in teenagers, young adults, youth, and adolescents (no ages provided). Twenty-six randomized controlled trials met the inclusion criteria for this review. Examination of the findings suggests that barriers to the implementation of e-Health applications include engagement and help-seeking, adherence, and professionals' concerns about the value, effectiveness, and safety of electronic applications (Christensen et al., 2011). The authors' conclusions are that further targeted research is needed to determine whether automated Internet applications 'work' as well as applications that are delivered by therapists, which has implications for the proposed study. In addition, Christensen et al. (2011) suggest that more research (quantitative and qualitative) is also needed to understand the reasons adolescents do not engage with e-Health applications.

Kirk et al. (2013) conducted a narrative synthesis of the research literature to examine self-care support interventions on the health status, psycho-social well-being, condition-related knowledge, health service use and participant satisfaction among children and young people with long-term conditions. The Kirk et al. review included a wide range of self-care support interventions. The relevance to this proposed study is that e-health approaches were included in the Kirk et al. study in particular the interventions were based on the Internet, the computer, and on text-messages. The inclusion criteria were randomized controlled trials, participants who were children and young people aged 0 to 16 years old diagnosed with asthma, diabetes, or cystic fibrosis, interventions that help children and young people be active and involved in managing

their conditions, and written in the English language and the search resulted in 13 studies. It must be noted that the ages of the participants were younger than the 18-19 year olds in the proposed study but it was included here for the information it can provide about e-Health and self-care strategies and because adolescents were included in the sample at least to some extent.

Inspection of the review findings suggests that there is strong evidence that child and young people self-care support interventions are effective in improving health and well-being, especially psychosocial outcomes (Kirk et al., 2013). The Kirk et al. (2013) findings suggest that e-Health interventions demonstrated favorable effects on outcomes. The authors' conclusions based on the information obtained from the review are that there is a need for more well designed randomized controlled trials that test interventions based on theory and in which parents and children are involved in their planning (Kirk et al., 2013).

Critique. A review of the literature was performed by searching for scholarly articles using key words female, adolescent, and e-Health; the two studies that met the criteria were reviewed and limitations were identified. In the Kirk et al. (2013) review studies that were written in English were included, while other languages were not included. The authors reported that studies related to asthma were over-represented ($n=10$) as compared to diabetes ($n=1$) and cystic fibrosis ($n=2$) because there was a dearth of randomized control trials for those conditions (Kirk et al., 2013).

Summary. The strength of the evidence was determined to be "level 1" (high) for the review of randomized controlled trials and "level 2" for the narrative synthesis. The quality rating was "A" and "B" respectively. According to Christensen et al. (2011) there is a need for more research related to the barriers of application programs which include difficulty in getting adolescents to use the applications, perceptions overall that the programs have low adherence,

and health care provider concerns that they are effective. A text messaging intervention may face similar barriers and therefore this study will anticipate this reality and plan to address them.

M-Health

      Theoretical. M-Health is a form of e-Health and "refers to the use of mobile devices in collecting aggregate and patient-level health data, providing care information to practitioners, researchers, and patients, as well as real-time monitoring of patient vitals, and direct provision of care (via mobile telemedicine)" (Reguly, 2009, p. 17). According to Crean (2010), m-Health is the use of mobile technologies, for example cell phones, to improve health systems performance. The WHO (2014b) defines mobile health (m-Health) as an area of electronic health (e-Health), that deals with providing health information and services communicated through mobile technologies like mobile phones. Istepanaian and Zhang (2012) state that "in the last decade, the seminal term and concept of "m-Health" were first defined and introduced… as 'mobile computing, medical sensor, and communications technologies for healthcare'" (p.1). The advent of the current 4G (4th generation) technology represents an evolution of the technology to implement m-Health since its inception in 2004 (Istepanaian & Zhang, 2012). According to Thirumurthy and Lester (2012), m-Health interventions can be seen as a way to support health care consumers as well as their health-care providers in a convenient and cost-effective way.

      Mobile phones can benefit patients and providers by helping overcome the health care consumer's inability to access needed resources on the supply side of health care while addressing barriers and limitations on the demand side (Thirumurthy & Lester, 2012). Inspection of the evidence suggests that m-Health can promote positive behavior change and improve health outcomes in areas where there are limited resources (Thirumurthy & Lester, 2012). E-Health and m-Health applications have potential when used together to improve physical and emotional

health outcomes (Vital Wave Consulting, 2009). Therefore, the application of e-Health and m-Health in a prenatal texting program may have the potential to promote positive behavior change as an effective adjunct to the prenatal education adolescents already receive.

Empirical. Recognizing the impact cell phone technology has on an adolescent's life and his or her need for health information, a review of the literature was performed using key words female, adolescent, and m-Health. Eleven studies were identified and several were eliminated because they were not relevant for the purposes of this study; therefore, six studies were reviewed and discussed here in greater detail.

Puccio et al. (2006) conducted a pilot study with 8 participants aged 16 to 24 years old using text messages to evaluate their highly active antiretroviral therapy (HAART) adherence. Participants received text messages daily for 4 weeks, on weekdays for 4 weeks, and on Sundays, Tuesdays, and Thursdays for 4 weeks (Puccio et al., 2006). Data were collected at 4-week intervals and again at the end of the study to determine satisfaction with the text messages, and missed medication doses (Puccio et al., 2006).

Inspection of the findings suggests that the calls were helpful and the level of intrusion acceptable; however, the 12-week intervention was not enough for most participants (Puccio et al., 2006). The authors' conclusions were that more research is needed to determine if cell phone reminder calls may improve long-term adherence to HAART medications and by association, health outcomes (Puccio et al., 2006). While this study addressed HAART adherence, the fact that it uses text messages to promote the health and wellness of adolescents makes it relevant for this study; the issue of adherence is one that will also need to be addressed.

Levine, McCright, Dobkin, Woodruff, and Klausner (2008) conducted 4 focus groups to evaluate SEXINFO, a sexual health text messaging service. Anonymous data were collected

from 322 participants, 12 to 24 years old; the mean age of participants was unclear. Examination

of the findings suggests that African Americans and youths 12 to 18 years old were more likely

to report campaign awareness; overall 11% of respondents reported awareness of the SEXINFO

campaign (Levine et al., 2008). The authors' conclusions were that text messaging holds promise

as an efficacious way to engage youths in sexual health education and referral services (Levine et

al., 2008) which has relevance to the proposed study in spite of the potential age differences

among participants.

Coker et al. (2010) conducted a qualitative study using 8 focus groups of adolescents (77)

and 2 focus groups of parents (21) and a constant comparative method to evaluate delivery of

health information for preventive services. The adolescent groups were stratified by gender, age

(13 to 15 years old ($n=37$, 48% of sample; and 16 to 17 years old $n=40$, 52% of sample), and

language (English or Spanish), while the parent groups were stratified by language alone (Coker

et al., 2010). The focus group discussion guide contained questions that related to perspectives

on preventive visits, ways to increase adolescent preventive health care access, and strategies to

use to engage adolescents in discussions of preventive health are topics (Coker et al., 2010). The

audiotaped data collected were transcribed, translated if needed, coded, and thematic analysis

based on grounded theory was performed (Coker et al., 2010). Evaluation of the findings

suggests that the adolescents prefer promotion of use of preventive services with technological

interventions (including text messages and MySpace) while parents prefer in-person delivery.

The authors' conclusions were that this study may help provide important information to use

when planning for adolescent preventive health care (Coker et al., 2010). The implication of the

findings for this study is that they suggest user satisfaction related to technological interventions

for preventive health services, such as prenatal text messaging to promote breastfeeding.

Ravert, Calix, and Sullivan (2010) conducted a feasibility study with 16 undergraduate student participants, 19 to 23 years old (M=20.4 years), to explore using text messages to collect quantitative and qualitative daily experience data. Students were randomly selected from a course roster and were sent identical text messages twice a day for seven days asking the following questions: "What are you doing now?", "How risky is what you are doing, 0-9?", and "What could happen?" (Ravert et al., 2010). The text messages were sent one of two ways: manually as a single message; and automatically at a predetermined time (Ravert et al., 2010). Inspection of the findings suggests that text messaging has the potential for collecting numerical and text responses with advantages that include low cost, minimal training needed to implement, favorable response rate, and participants most likely already have the necessary equipment (cell phones) (Ravert et al., 2010). The authors' conclusions were that text messaging holds promise as a means by which to collect numerical and text data, especially when the responses are open-ended and across multiple time points (Ravert et al., 2010). There were a number of similarities in design and intervention between the Ravert et al. study and the proposed study, but most importantly inspection of the findings suggests that text messaging as a health promotion intervention can be feasible and efficacious.

Sirriyeh, Lawton and Ward (2010) used an experimental design with random assignment to pilot the use of text messages focused on physical activity behavior changes over the course of two weeks. The sample consisted of 120 participants ages 16-19 (M=17.3 years, SD= 0.68, 70% female) who were assigned to one of three experimental groups: instrumental messages (n=30); affective messages (n=31); and both (n=31); or the control group (n=28). Data were collected with a physical activity questionnaire measuring physical activity behavior administered at baseline and again at the end of the two weeks (Sirriyeh et al., 2010).

Examination of the Sirriyeh et al. (2010) findings suggests that physical activity levels increased for inactive participants with the affective messages about the benefits of physical activity being the most effective (Sirriyeh et al., 2010). The researchers report that affective text messages (emotional benefits) represent immediate as opposed to the long-term outcomes of the instrumental messages (physical benefits) (Sirriyeh et al., 2010). The authors' conclusions are that for inactive adolescents, affective text messages may be more effective for increasing physical activity levels (Sirriyeh et al., 2010). The relevance of this information to this proposed study is that affective text messages may also help pregnant adolescents aged 18-19 years old achieve positive outcomes for themselves and their newborns. Therefore, the prenatal intervention will include affective text messages (emotional benefits) to represent the immediate outcomes that are most effective for this population.

Perry et al. (2012) used weekly text messages to inform 26 adolescents aged 15 to 20 years old from Los Angeles County about sexual health. Data were collected in three focus groups and themes and codes that followed from the transcripts of the discussions related to the text messages (Perry et al., 2012). Both content and acceptability were discussed related to the use of the text message format to deliver information of this sensitive nature. In three focus groups participants shared that the text messages about sexual health were informative, simple, social, convenient, and provided a sense of privacy. The authors' conclusions were that text messaging may be an innovative way to engage adolescents in learning about sensitive topics like sexual health education (Perry et al., 2012). Despite the older mean age of the participants in this study as compared to the participants in the proposed study, inspection of the findings suggests that there is relevance because text messaging may be a feasible and efficacious

intervention with which to inform adolescents about sensitive health topics like sex and breastfeeding.

Critique. A review of the literature was performed using key words female, adolescent, and m-Health. The studies that met the criteria were reviewed and limitations were identified.

Perry et al., (2012) used self-selection for their sample of participants and because these participants agreed to engage in conversation about sexual topics, they may not exactly represent the adolescent population in terms of comfort and knowledge of sexual health. Coker et al. (2010) had missing data due to an inability to contact participants, or their refusal to participate, limiting the ability to generalize findings. The Coker et al. study used a sample limited to a specific health plan (Medicaid) and a specific geographical area (Los Angeles County, California) which may not represent the perspectives of other adolescents in different plans or from other locations.

Levine et al. (2008) report that their work was not research but rather a public health practice (field action report) so that no human subject approval was needed nor was it obtained. The Puccio et al. (2011) study had a small sample size which limits generalizability and because the diversity of the sample did not match the diversity in the population, acceptance of cell phone reminders and thus social response bias may have impacted the data.

Ravert et al. (2010) report an inability to track when participants received and sent text messages, making it difficult to know if the text messages had in fact been received, and whether the messages were being sent back and forth in a timely fashion (Ravert et al., 2010). The text messages in the Ravert et al. study were not linked to identifying information, yet there was no way to guarantee anonymity of the participants as the messages were being sent to a specific cell phone number; this may have resulted in response bias.

Summary. The overall strength of the m-Health evidence reviewed was determined to be "level 3." The quality rating was "C" (low quality) mostly for issues related to methodology. The research studies while somewhat flawed do provide examples of different ways in which technology, especially text messaging, have been used to promote adolescent health. Examination of the findings suggests that text messaging may be an effective and enjoyable way for adolescents to learn information about sensitive topics like sexual health (Perry et al., 2012) and other topics as well. In general, there is a growing body of evidence that supports the use of text messaging as an intervention, but its usage in the promotion of adolescents' decision-making process as it relates to breastfeeding appears to be quite limited.

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Adolescent Health Education

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The previous section addressed the different ways that adolescents are educated in health topics, including e-Health, and m-Health strategies. The following section will explore how adolescent health education is provided in community and school settings. There is no theoretical literature presented.

Community and School Settings

Empirical. A review of the literature was performed by using key words adolescent, health education, community, and school setting. Six studies were identified and were eliminated because they addressed topics with limited relevance to this proposed study. The remaining two studies were reviewed and will be discussed in further detail.

Higgins, Begoray, and MacDonald (2009) used a social ecological model to investigate health literacy as a part of health curricula in four high schools located in British Columbia. The sample ($n=194$) was drawn from a population of students followed from tenth to twelfth grade and who ranged in age from 14 to 17 years old. Higgins et al. used a case study approach to

explore the effectiveness of a curriculum model called Planning 10. A 30-item survey was administered to participants who were asked about: preferences for accessing health information; factors impacting health; how health information accuracy is determined; physical activity levels; and how schools can improve students' health (Higgins et al., 2009). Inspection of the findings suggests that health education cannot be taken out of the context of environments and resources that promote behavior change (Higgins et al., 2009). The Higgins et al. study was not conducted in the United States but was included because it provided information that supports Bronfenbrenner's (1979) Ecological Systems Theory and Johnson and Puplampu's (2008) Ecological Techno-Subsystem as the theoretical underpinning for this study. In general, while the sample was slightly younger than the proposed study, the Higgins et al. study reinforces the idea that an adolescent's environmental influences are an important part of their development and must be considered when planning for behavioral change.

Stigler, Neusel and Perry (2011) reviewed the evidence on school-based adolescent alcohol prevention interventions in a summary article based on several reviews focusing on alcohol prevention. Examination of the findings suggests that most school-based alcohol prevention programs are geared for middle school students with a goal of delaying the onset of alcohol use by reducing individual risk factors (Stigler et al., 2011). According to the investigators characteristics of the most effective school-based alcohol prevention programs include interventions that are based on theory, that take into consideration social norms about alcohol, that counter pressure to use alcohol with skill-building strategies, that employ developmentally and culturally appropriate learning, that incorporate peer-to-peer strategies, that includes contextual factors from the community, and that supports leaders having adequate levels of training and support (Stigler et al., 2011). The authors' conclusions are that alcohol prevention

programs need to begin in schools but incorporate all aspects of the adolescents' environment in order to be effective (Stigler et al., 2011). This supports the use of Bronfenbrenner's (1979) Ecological Systems Theory and Johnson and Puplampu's (2008) Ecological Techno-Subsystem as the theoretical underpinning for this study because it emphasizes the need to consider the adolescent's environment in school-based prevention programs.

Critique. A review of the literature was performed by searching for scholarly articles using key words adolescent, health education, community, and school setting; the studies that met the criteria were reviewed for their strengths and limitations. The results presented in the Higgins et al. study reflect only first year data, and are therefore cross sectional for students when enrolled in grade 10. Stigler et al. (2011) wrote a summary article which was essentially based on previous reviews, therefore the quality of this article is limited.

Summary. The evidence related to adolescent health education in community and school settings was reviewed. The scientific evidence is quite limited, therefore the strength of the evidence was determined to be "level 3" and the evidence was deemed to be of limited quality ("C"). The studies reviewed in this section did however provide support for the use of Bronfenbrenner's (1979) Ecological Systems Theory and Johnson and Puplampu's (2008) Ecological Techno-Subsystem as the theoretical underpinning for this study because they include the adolescent's environment as an important contextual factor in the planning and implementation of school-based programs.

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Adolescent Prenatal Education

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The previous section addressed the different ways that adolescents are educated in specific health topics in school. The following section will explore how adolescent prenatal education is provided.

Educational efforts can influence positively both the immediate and long-term health outcomes of adolescent mothers and their infants in a number of ways (Ford et al., 2002; Koniak-Griffin, Anderson, Verzenieks, & Brecht, 2000; Walker & Worrell, 2008). Adolescents often need more support and teaching during pregnancy and the postpartum period as compared to adults; this may be due to the fact that adolescents have less life experience which may make them less flexible to meet the demands and challenges of pregnancy and birth (Montgomery, 2006). Nursing care for the physical, emotional, and educational needs of adolescents during the perinatal period therefore needs to be judgment-free and developmentally appropriate (Montgomery, 2006). This section will summarize the state of the science related to where adolescents receive health education, including community and school settings, home visits, and group-visit models. There is no theoretical literature reviewed for the following two sections.

Community and school settings

Empirical. The topic of adolescent prenatal education in community and school setting is relevant to this study because it is important to understand from where adolescents may be obtaining their prenatal health information. A review of the literature was therefore performed by using key words female, adolescent, school, community, prenatal, and health education. Four studies were identified; one was eliminated because it was written in Portuguese. Three studies were reviewed and will be discussed in further detail.

Bloom (2005) used a non-equivalent control group design in a pilot study that examined group oriented prenatal care for adolescents delivered in a school-based clinic and then compared that to adolescents in the same school who utilized traditional prenatal care only. The sample ($n=63$; 53 traditional prenatal care, 10 group-based care) included self-selected adolescents who were attending a young parents center, were 14-18 years old ($M=15.84$ years,

SD=1.17), less than 22 weeks gestation and were not considered at high-risk for prenatal care (Bloom, 2005). The outcomes measured were pregnancy-related health outcomes, knowledge, self-esteem, health-related locus of control, maternal confidence, repeat pregnancy, and satisfaction (Bloom, 2005). The investigator's conclusions were that this model of group-based prenatal care was developmentally appropriate for adolescents and promoted satisfaction among participants as well as positive pregnancy health outcomes (Bloom, 2005).

Strunk (2008) conducted an integrative review using the CINAHL and PubMed databases and the following key phrases: teenage pregnancy; teenage pregnancy outcomes; school nurse; and school-based health clinic to identify a total of 13 studies about school-based clinics and their impact on adolescent pregnancy outcomes. Examination of the findings suggests that school-based clinics in general support the achievement of positive adolescent pregnancy outcomes related to adolescent education, prevention of developmental delays, promotion of health for mom and baby, and prevention of repeat pregnancies (Strunk et al., 2008). The author's conclusions were that school-based clinics provide much-needed care to adolescent moms and their babies (Strunk et al., 2008). This study applies to the proposed study in sharing goals related to supporting the achievement of positive adolescent pregnancy outcomes related to adolescent education and promotion of health for mom and baby.

Schaffer, Goodhue, Stenner, and Lanigan (2012) described the Minnesota visiting nurse agency-created, community-based "Pregnant and Parenting Teen Program" in an article that highlights the development and foundation of the program, goals, and the program effectiveness. This program provides home visits for adolescent mothers before and after birth. The participants in the Pregnant and Parenting Teen Program must be under 20 years old, and must enroll their baby before s/he is 2 months old, or they may enroll if they have more than one child and are

under 20 years old (Schaffer et al., 2012). The participants may continue in the program until they graduate from high school, until the baby is 2 years old, or if they have graduated as long as the baby is under 2 years old. The authors describe four main aspects to the Pregnant and Parenting Teen Program which include home visits with a public health nurse, collaboration with school, hospitals, and other agencies, mental health education, and community support through provision of needed items to parent well (Schaffer et al., 2012).

The evaluation strategy for the Pregnant and Parenting Teen Program was described by the authors as an assessment of changes in participants' behaviors. Program effectiveness was therefore measured as identification of pregnant and parenting mothers, birth outcomes, school enrollment status, repeat pregnancy, mom/baby bonding and attachment, use of community resources, and baby growth and development (Schaffer et al., 2012). For the purposes of program development, 968 adolescent mothers (77% of those eligible) were referred to the program, and 758 adolescent mothers (78% of those referred) enrolled (Schaffer et al., 2012). The outcome data showed progress in meeting program objectives overall; the authors conclude that the Pregnant and Parenting Teen Program strengthens the adolescents' social environment and provides comprehensive support for them (Schaffer et al., 2012). The study has limited applicability to the proposed study with the exception of having a similar sample in terms of age and sharing the goal of promoting positive changes in participants' health behaviors.

Critique. A review of the literature was performed by searching for scholarly articles using key words female, adolescent, school, prenatal, and health education; the studies identified were reviewed and limitations were identified. Strunk (2008) reports that a limitation of her review was the lack of representation of any research in progress and research reports that were not published. Bloom (2005) reported that the results of her pilot study were affected by: a small

sample size that had unequal groups, this limited the ability to make decisions about the differences between the two groups of participants; self-selection of participants into the groups; and a high rate of attrition on the traditional prenatal care group (Bloom, 2005). Schaffer et al. (2012) did not report statistical analyses in order to be able to determine whether significant differences existed in program outcomes for participants. According to Schaffer et al. outcome measures were not consistent: sometimes the participants were compared to adolescents that were participants and non-participants alike; sometimes only a fraction of the participants were used; sometimes there was a small response rate; and for repeat pregnancy, the time allowed for that measure was not really long enough.

Summary. In conclusion, the evidence was reviewed and a number of limitations were identified. The strength of the evidence was "level 1" for the Strunk (2008) integrative review with an "A" quality rating, and "3" for the other studies with a "C" quality rating. The scientific evidence does provide some information about where adolescents obtain prenatal information which is relevant to this study because the text messaging intervention will augment any usual prenatal care practices.

Home visits

Empirical. A review of the literature was performed by using key words female, adolescent, and prenatal home visits. There were eight studies identified, one was eliminated because it was a summary of poster presentations at an academic symposium, two were eliminated because they were not about home visits, and one was eliminated because it was a repeat from the previous section (Schaffer et al. 2012). The remaining four studies were reviewed.

Kitzman et al. (2010) conducted a twelve-year follow-up study of a randomized controlled trial to test the effect of prenatal and infancy home visits by nurses on 12-year-old, firstborn children's use of substances, behavioral adjustment, and academic achievement. The intervention consisted of nurses visiting adolescents in their homes prenatally and after giving birth. The sample consisted of predominately African American 12-year-old firstborn children of adolescent mothers from an urban setting ($n= 613$). Examination of the findings suggests positive impacts of the intervention related to less maternal role impairment from use of drugs and alcohol (0% vs. 2.5%, $p=.04$), longer relationships with partners (59.58 vs. 52.67 months, $p = .02$), and stronger sense of mastery (101.04 vs. 99.60, $p=.005$) (Kitzman et al., 2010). In addition, the authors report the findings suggest reduced governmental spending on supplemental programs ($8772 vs. $9797, $p=.02$), which may indicate long term positive financial benefits of a prenatal nurse home visiting intervention for the mother as well as evidence of the impact of prenatal education and support on positive outcomes for adolescent mothers and their babies (Kitzman et al., 2010). The authors concluded that reduced governmental spending may indicate a more efficient use of governmental spending resources which may have implications for health care spending policy (Kitzman et al., 2010). This has relevance for this proposed study because it provides support for prenatal text messaging interventions which may have the potential to be effective, both in terms of outcomes and cost.

The Teen Parenting Partnership (TPP) intervention was tested with quasi-experimental methods to determine its impact on adolescent resource utilization and birth outcomes by Flynn, Budd, and Modelski (2008). The intervention was an interdisciplinary approach to the promotion of resource utilization and access among pregnant adolescents through one home visit a week by a social worker and one visit a week by a public health nurse for a minimum of one year and up

to 3-5 years if desired (Flynn et al., 2008). The sample for the study was 83 pregnant adolescents that met the following criteria: 18 years old or younger (*M*=17.0 years, *SD*= 1.18); primigravida; and from designated urban areas of New Jersey (Flynn et al., 2008). The conceptual model used was the Vulnerable Populations Conceptual Model (Flaskerud & Winslow, 1998). The outcomes measured were: demographic information, resource information, and prenatal care utilization before birth, and birth outcomes after birth (Flynn et al., 2008). The examination of the findings from this study support the hypotheses indicating a significant increase in: adolescents using a prenatal care provider; adolescents who made and kept appointments with their prenatal care provider; adolescents enrolled in the WIC program and who received WIC supplementation; and were enrolled in the Medicaid program (Flynn et al., 2008). The authors concluded that inspection of the findings suggests an association between participation in the TPP and improved resource utilization among prenatal adolescents (Flynn et al., 2008). The relevance to this study is that Whispers2Mom is an intervention that will be used with usual care practices (which may include TPP) and may have the potential to promote resource utilization among adolescents through education.

Barnet, Liu, DeVoe, Alperovitz-Bichell, and Duggan (2007) explored the effect of a home visiting program for adolescent mothers (*M*=16.9 years, *SD*= 1.4) in a randomized controlled trial with two groups: control (usual care- *n*=40) and the intervention group (home visits- *n*=44). The home visiting program was based on the Transtheoretical Model (Prochaska & DiClemente, 1983) and included monthly home visits with education about parenting and support provided. The outcomes measured were poor parenting, becoming pregnant again, depression, utilization of primary care, and dropping out of school (Barnet et al., 2007). Examination of the findings suggests that measures of parenting and continuation of school were

higher in the home visit group as compared to the control group; but there was not an impact on measures of repeat pregnancy, depression, or utilization of primary care services (Barnet et al., 2007). The authors' conclusions were that this trial supports previous research that home visits can improve outcomes like parenting and staying in school for adolescent mothers (Barnet et al., 2007). The Barnet et al. (2007) study has implications for this study because it addresses the importance of providing social support in the form of home visits in its intervention.

Barnet et al. (2009) conducted a randomized controlled trial in Baltimore, Maryland to evaluate the efficacy of a computer-assisted motivational intervention (CAMI) in reducing repeat births of adolescent mothers (within 2 years). Criteria for study participation included 12 to 18 years old (M= 17.0 years, SD= 1.2), and pregnancy 24 weeks or more (Barnet et al., 2009). The intervention was based on the Transtheoretical Model (Prochaska & DiClemente, 1983) and consisted of the adolescent answering questions on the computer about her sexual relationships, and contraceptive use from which the CAMI software calculated the stage of change (Barnet et al., 2009). This information was then used to customize a motivational interview session with trained counselors who matched her stage of change to her needs, specifically for motivation to use contraception and avoid another birth (Barnet et al., 2009).

The intervention began within six weeks of birth and occurred quarterly for a total of 9 possible sessions (Barnet et al., 2009). The total number of participants was 235: a control group (n=68) involved usual care practices; and the intervention which was offered two ways- CAMI alone (n=87), and CAMI plus home visits (n= 80). The home visiting aspect of the intervention involved home visitation at least monthly, parent training, and case management (Barnet et al., 2009). Examination of the findings suggests that the CAMI plus home visits group showed a tendency to have lower birth rates when compared to the usual care and CAMI alone groups

(Barnet et al., 2009). The authors' conclusions were that adolescents who received two or more CAMI sessions plus home visits may experience fewer repeat births within two years (Barnet et al., 2009). Inspection of the findings suggests that the home visiting aspect of the intervention provided social support to the adolescents which has relevance for this study because the Whispers2Mom intervention will provide social support within the adolescent's Techno-Subsystem.

Critique. A review of the literature was performed by using key words female, adolescent, and prenatal home visits; the studies identified were reviewed and limitations were identified. Several of the studies used a small sample size (Barnet et al., 2007; Flynn et al., 2008). Flynn et al. (2008) lost 22.9% of the original intervention group to attrition so cautious interpretation of findings is recommended. Barnet et al. (2009) also report attrition at the 2-year postpartum interview which may limit the ability to make causal inferences about repeat births. Some of the authors (Barnet et al., 2007; Barnet et al, 2009; Flynn et al., 2008) discuss that they did not have equivalent groups so the potential for there being systematic differences between groups that influenced outcomes cannot be ruled out. Barnet et al. (2007) used self-report of parenting outcomes which may have introduced bias. Kitzman et al. (2010) also used self-report, for instance to measure substance use. Barnet et al. (2009) describe differences among CAMI counselors and home settings that may have potentially affected the quality of the delivery of the intervention and thus may have introduced bias into the interpretation of the findings.

Summary. The evidence related to prenatal home visits was reviewed and most of the scientific evidence was based on randomized controlled trials or quasi-experimental studies. In spite of the limitations described in the previous paragraph the strength of the scientific evidence was found to be "level 2" and the quality rating was determined to be "B" or good quality, even

though it does exhibit some risks for bias and inaccuracies. In general, these studies show that home visits are efficacious in meeting positive outcomes for adolescents by providing the social support they need to manage the tremendous changes in their lives.

Group-visit model

  Theoretical. Ideally a prenatal intervention for adolescents will address their unique developmental needs. Every adolescent must adjust to the physical and emotional changes associated with adolescence. But the pregnant adolescent must deal with those developmental challenges as well as all the physical and emotional changes associated with the pregnancy. The pregnant adolescent must face social tasks that differ from her non-pregnant counterparts; this includes building a relationship with the fetus, and working on defining her mothering role (Bloom, 2005). Group-based care is one way to provide prenatal care that takes into account the developmental needs of adolescents (Bloom, 2005).

  Empirical. A review of the literature was performed by using key words female, adolescent, prenatal, and group-visit model. There were thirteen studies identified. Many studies were eliminated because they were not applicable to the proposed study. The remaining four studies were reviewed.

  Stevens, Iida, and Ingersoll (2007) wrote an article that described the importance of oral health to a healthy pregnancy, evidence-based oral health guidelines in pregnancy care, and ways that oral health strategies have been used with pregnant adolescents. According to the authors, the Rochester Adolescent Maternity Program (RAMP) has been successfully providing prenatal care to adolescents in Rochester, NY for over 40 years; CenteringPregnancy (Rising, 1998) is the pregnancy care model used with RAMP. (Stevens et al., 2007). In RAMP, 6 to 8 adolescents (possibly with partners or mothers) meet in 6 to 7 sessions that last about 90 minutes to focus on

educational topics and to provide support to each other (Stevens et al., 2007). In RAMP the

participants have a health care provider and dentist throughout their pregnancy and oral health

topics are included in the 5th CenteringPregnancy group meeting (Stevens et al., 2007).The

authors report that the data gathered from tracking oral health services in the RAMP program

show promise as a way to encourage young families to engage in oral health education,

screening, and services (Stevens, et al., 2007). The authors' conclusions are that the RAMP

process using the CenteringPregnancy model (Rising, 1998) serves as a model for promoting oral

health in a group prenatal practice among adolescents (Stevens, et al., 2007). The relevance to

the proposed study is that the CenteringPregnancy model (Rising, 1998) is based on the idea that

social support is important to achieving positive health outcomes for adolescent mothers and

their newborns and this article describes an intervention that is successfully used in addition to

usual prenatal care practices.

Walker and Worrell (2008) compared the group-visit model of prenatal care called

CenteringPregnancy (Rising, 1998) to traditional, individual care, and found common elements:

health assessment, health promotion, and follow-up procedures. This comparison of the different

ways to provide prenatal care addressed all women of childbearing age and did not specifically

address the adolescent population. The authors explain that the difference between the traditional

model of prenatal care and the CenteringPregnancy model is that more education and support are

offered in the CenteringPregnancy model from group facilitators, guest speakers, and pregnant

women members of the group (Walker & Worrell, 2008). The CenteringPregnancy program

contains ten 90-minute sessions that are each divided into two or more discussion and education

sessions and begins between 12 and 16 weeks gestation, ending in the early-postpartum period.

Written and video resources facilitate the discussion and supplement the educational information

provided. The authors report that among CenteringPregnancy's greatest benefits are that it helps patients make better health choices and improves perinatal outcomes; the authors' conclusion is that group prenatal care overlapped with childbirth education classes has the potential to be an efficient and effective means of delivering prenatal education (Walker & Worrell, 2008).

Kershaw, Magriples, Westdahl, Rising, and Ickovics (2009) examined whether an HIV prevention program combined with group prenatal care (CenteringPregnancy- Rising, 1998) would reduce sexually transmitted infections, repeat pregnancies, risky behaviors, and psychosocial risks. Kershaw et al. used a randomized controlled trial with a sample ($n=1047$) which included adolescent pregnant women aged 14 to 25 years old ($M=20.4$ years, $SD=2.6$) from two different sites- Atlanta, GA and New Haven, CT. The participants were randomly assigned to three groups as follows: usual prenatal care practices alone ($n=394$, 38%); CenteringPregnancy ($n=335$, 32%); and CenteringPregnancy + HIV prevention ($n=318$, 30%) (Kershaw et al., 2009). The outcomes measured were STIs and repeat pregnancy rates, behavioral outcomes (condom use), and psychosocial outcomes (safe sex and HIV discussions with partners) (Kershaw et al., 2009). Examination of the findings suggests that adolescents in the CenteringPregnancy + HIV prevention group were significantly less likely to become pregnant again by 6 months postpartum, reported increased condom use and decreased unprotected sex, and less incidence of STIs as compared to the other groups (Kershaw et al., 2009). The authors' conclusions were that the CenteringPregnancy + HIV prevention intervention reduced risks for HIV in this sample (Kershaw et al., 2009). This study demonstrates how adolescents can benefit from social support in reaching positive prenatal and postpartum health outcomes.

Ickovics et al. (2011) conducted a study with 1047 young women (*M*= 20.4 years old, *SD*= 2.6) to determine whether an intervention that has already been shown to improve negative birth outcomes for adolescent mothers can also improve psychosocial outcomes. The intervention is called CenteringPregnancy Plus (CP+) and involves small group prenatal care led by a trained prenatal care provider who addresses physical assessment, educational and support needs, plus skills-building in the areas of prevention, including social skills (Ickovics et al., 2007; Ickovics et al., 2011; Kershaw et al., 2009). CenteringPregnancy and CP+ are designed to improve birth outcomes like preterm birth, satisfaction with prenatal care, breastfeeding, and short interval repeat pregnancies as well as decrease sexual risk, and positively impact psychosocial outcomes (Ickovics et al., 2007; Kershaw et al., 2009).

In the Ickovics et al. (2011) study, participants were randomized to one of three groups: standardized individual care (40%); CenteringPregnancy group care alone (30%); and CP+ (30%). Data collection included review of medical records, self-report of demographic, social, and behavioral characteristics, completion of measures for stress (Perceived Stress Scale- Cohen, Kamarck, & Mermelstein, 1983), self-esteem (Rosenberg, 1965), social support and social conflict (Social Relationship Scale- O'Brien, Wortman, Kessler, & Joseph, 1993), and depression (Radloff, 1977), structured interviews at the beginning of the study, and follow-up interviews during the third trimester, 6, and 12 months (Ickovics et al., 2011). Examination of the findings suggests that adolescents at the highest level of psychosocial stress who were assigned to the CP+ group reported increased self-esteem, and decreased stress and social conflict in the third trimester with decreased social conflict and depression at one year follow-up (Ickovics et al., 2011). The authors' conclusions were that the CP+ intervention had potential for addressing psychosocial issues experienced by adolescent mothers (Ickovics et al., 2011). The Ickovics et al.

study has relevance for this proposed study because it addresses the efficacy of an intervention that uses social support for pregnant adolescents who are a population at risk for psychosocial stress. Therefore, prenatal text messages that encourage adolescents to utilize sources of social support within their own environments may prove beneficial in improving breastfeeding rates by increasing self-esteem and decreasing stress.

Critique. A review of the literature was performed by searching for scholarly articles key words female, adolescent, prenatal, and group-visit model; the studies identified were reviewed and limitations were identified. Ickovics et al. (2011) and Kershaw et al. (2009) used a specific subset of the population (young, minority, poor adolescents from an urban area) so the findings may not be generalizable to other populations. Ickovics et al. report group differences may occur in spite of randomization, therefore when they examined group differences at the beginning of the study they found race, health behavior, and self-esteem had baseline differences and so controlled for these differences in the analyses. Many of the measures in the Ickovics et al. study were self-report (stress, self-esteem, social support, social conflict, depression, and health behaviors) and therefore potentially at risk for response bias. Kershaw et al. report differences between conditions, but because average effect sizes were small (0.19) the interpretation is that the difference was considered modest in size. Stevens et al. (2007) report that the RAMP program evaluation data is somewhat limited, but that the data will continue to be collected in order to understand the impact of the program on oral health outcomes.

Summary. The strength of the evidence was examined and found to be "level 1" and "level 2" while the quality rating was "B" and "C." Overall, the evidence while limited suggests that prenatal educational programs in general, and in a group setting in particular, may achieve positive outcomes for adolescent mothers and their babies (Ford et al., 2002; Koniak-Griffin et

al., 2000; Walker & Worrell, 2008). However, research is needed to determine whether a more immediate, daily form of education such as prenatal text messaging may be efficacious as a prenatal educational strategy to promote adolescent breastfeeding.

The following section will explore the concept of adolescent breastfeeding, including the statistics related to adolescent breastfeeding, the need to increase those numbers and why, and the specific adolescent issues associated with breastfeeding intention, as well as specific adolescent breastfeeding strategies.

Adolescent Breastfeeding

Human milk is uniquely suited to human infants. The United States' Healthy People 2020 report identifies breastfeeding as the most complete form of nutrition for most infants, with a wide range of benefits for their health, growth, immunity, and development (United States Department of Health and Human Services (USDHHS, 2011a). The Healthy People 2020 goals have established the target proportion of infants who are breastfed at 81.9% (United States Breastfeeding Committee, 2011). Adolescents aged 18 to 19 were responsible for nearly 500,000 births in the U.S. (Kost, Henshaw, & Carlin, 2010), and while the research shows that overall breastfeeding rates have increased steadily since the 1990s, there have not been significant gains among adolescents (Nelson, 2009). In fact, rates of breastfeeding in adolescents have been declining since 2003 (Feldman-Winter & Shaikh, 2007). "In 2004, mothers under 20 had an "ever breastfed" rate of only 53.5% compared with a rate of 69% for women age 20 to 29 and 77.1% for women age 30 and over" (Nelson, 2009, p. 250).

The low rates of breastfeeding among adolescents are of concern for a number of reasons. Adolescents have an increased risk for premature and small-for-gestational-age infants and breastfeeding provides these infants with many health benefits specific to their individual needs

(Chedraui, 2008). Adolescents are also at higher risk for ineffective maternal/newborn bonding, and breastfeeding has been shown to improve feelings of attachment (Lounds et al., 2005; Nelson, 2009). The protective factors available to the baby through breastfeeding cannot be overstated.

Breastfeeding offers not only several immunologic and nutritional benefits for newborns and infants, but physiological and psychological benefits to mothers as well (American College of Obstetricians and Gynecologists, 2007a; 2007b; American Dietetic Association, 2009; Buckley & Charles, 2006; Dermer, 2001). But despite the documented benefits of breastfeeding, research suggests that infants of mothers who are younger are far less likely to be breastfed (McDowell, Wang, & Kennedy-Stephenson, 2008). In fact, findings from the National Health and Nutrition Examination Survey (1999-2006) reveal that the breastfeeding rates of U.S. adolescent mothers (under 20 years of age) were much lower (43%) when compared with mothers who were older (65% for 20-29 year olds; 75% for 30 years of age and beyond) (McDowell et al., 2008). Therefore, considering the health benefits of breastfeeding to mothers and babies, the high percentage of adolescents aged 18 to 19 that give birth, and the low rates of breastfeeding among adolescents in general, it is beneficial that the nursing profession examine strategies to increase breastfeeding intention among the members of this specific population.

Adolescent Prenatal Breastfeeding Education

Theoretical. Adolescents are one of the least likely demographic groups to breastfeed, which is unfortunate considering that adolescent mothers and their infants stand to benefit the most from breastfeeding (Feldman-Winter & Shaikh, 2007). Wambach and Cole (2000) state "the social and economic disadvantages affecting many adolescent mothers can be offset by the positive contribution that breastfeeding and human milk can provide for mother and infant" (p.

95

282). Education about the benefits of early infant nutrition plays a critical role in the health and well-being of the individual throughout life (Heinig et al., 2006); this is true for any segment of the population, but may be especially important for adolescents who are at increased risk for negative birth outcomes.

Empirical. A review of the literature related to adolescent prenatal breastfeeding education was performed using key words female, adolescent, prenatal, education, and breastfeeding. Five studies were identified and reviewed.

Dykes, Moran, Burt, and Edwards (2003) explored the experiences and support needs of adolescent mothers (aged 13-19 years) through focus groups and in-depth semi- structured interviews in the United Kingdom but was included here for the information it provided about adolescent breastfeeding support. The authors used a convenience sample and qualitative methods that included three phases. The first phase included focus groups (*n*=2 focus groups, 7 participants, aged 16-19 years old) that explored the adolescent mothers' breastfeeding experiences. Next the authors presented vignettes developed from analysis of the adolescents' breastfeeding experiences in the focus groups to midwives and supporters of the Breastfeeding Network, and solicited their responses. The differences between the responses from the focus groups and participants who viewed the vignettes were then used to develop semi-structured interviews for use with the adolescent mothers (*n*=13, aged 14-19 years old). Analysis of the qualitative data from the focus groups revealed five themes related to the experiences of breastfeeding: feeling watched and judged, lacking confidence, tiredness, discomfort, and sharing accountability (Dykes et al., 2003). The semi-structured interviews focused on support themes and by the tenth interview the authors became aware that five global themes were identified and no new themes were emerging (Dykes et al., 2003).

The themes that emerged from the data were: emotional support, esteem support, instrumental support, informational support, and network support (Dykes et al., 2003). The authors concluded that in terms of support needs, no single area of support can be considered irrespective of the other areas, and all five areas must be provided within a trusting relationship to maximize breastfeeding success (Dykes et al., 2003). The themes support the use of Bronfenbrenner's (1979) Ecological Systems Theory and Johnson and Puplampu's (2008) Ecological Techno-Subsystem as a framework for this study.

Feldman-Winter and Shaikh (2007) reviewed the literature to promote, support, and protect breastfeeding in adolescents, focusing on the epidemiology, targeted interventions, and legal, physiological, and nutritional issues. Inspection of the evidence suggests that adolescents' infant feeding decisions are based on a complex process that needs to be addressed individually and with cultural sensitivity (Feldman-Winter & Shaikh, 2007). The authors' conclusions are that adolescent breastfeeding interventions need to take into consideration the adolescents' developmental level, as well as the need for patient-centered care, and multidimensional support (Feldman-Winter & Shaikh, 2007). The relevance of the Feldman-Winter & Shaikh, 2007) review to this study is that in both cases there is a consideration of the developmental level of the adolescent.

Mossman, Heaman, Dennis, and Morris (2008) conducted a prospective, correlational study to examine the confidence and attitudes of adolescent breastfeeding mothers' initiation and duration in Manitoba, Canada. The sample ($n=100$) was comprised of pregnant adolescents aged 15-19 ($M=16.82$, $SD=1.18$) years, with their highest grade completed being 7-12 ($M=9.38$, $SD=1.16$) and with the following inclusion criteria: greater than 34 weeks of gestation, singleton fetus, keeping the baby, and considering breastfeeding (Mossman et al., 2008). Baseline

questionnaires were administered regarding breastfeeding attitudes, self-efficacy, and

demographic information with follow-up contact occurring during the first week postpartum and

at four weeks if still breastfeeding (only 46 were still breastfeeding at that time). The authors'

findings were that more adolescent mothers having higher prenatal attitude scores started

breastfeeding, while adolescent mothers who had higher prenatal breastfeeding attitude scores

and higher confidence scores before and after birth were more likely to continue breastfeeding

(Mossman et al., 2008). The authors' conclusions were that breastfeeding success after giving

birth was related to high scores on two scales: the attitude scale and the self-efficacy scale

(Mossman et al., 2008). The Mossman et al. (2008) study was conducted outside the United

States (in Canada) but was included here because the information obtained is important to this

study in how it provides information about how an adolescent mother's intention to breastfeed is

made.

Grassley (2010) performed a synthesis of the literature from the MEDLINE and CINAHL

databases for years 2000 to 2009 related to the support needs of adolescent breastfeeding

mothers and identified 18 studies that focused on five areas of social support: informational,

instrumental, emotional, esteem, and network. Each area of support need was addressed

individually and in combination with the other areas. Specifically, Grassley's objective was to

define aspects of social support that adolescents need from nurses when initiating breastfeeding

in the early postpartum period. Grassley (2010) describes how adolescent mothers may feel

hesitant to ask for information and offers suggestions for nurses to initiate the conversation. In

addition, Grassley (2010) emphasizes the importance of adolescents' need for privacy when

breastfeeding and provides strategies to facilitate that process. The author's conclusion was that

by integrating all the different dimensions of social support into their nursing care, adolescents

can be provided with positive breastfeeding experiences which will help promote the long-term

health and wellness of adolescent mothers and their babies (Grassley, 2010). Inspection of these

findings suggest that they support the use of Bronfenbrenner's (1979) Ecological Systems

Theory and Johnson and Puplampu's (2008) Ecological Techno-Subsystem as a framework for

this study in the way that nurses were an important source of social support.

Wambach et al. (2011) conducted a randomized controlled trial using the Theory of

Planned Behavior (Ajzen, 1991) to study an educational and counseling intervention provided to

adolescent mothers by lactation consultant-peer counselor teams as a way to increase

breastfeeding initiation and duration. The study was conducted in a Midwestern bi-state

metropolitan area, with the sample chosen from agencies like health departments, urban public

and private teaching hospitals, prenatal clinics, and high schools (Wambach et al., 2011). The

participants were between 15 and 18 years old (*M*=17, *SD*=0.9), primigravidas, planning to keep

the baby, able to speak and read in English, and able to be reached by phone, while adolescents

experiencing high risk pregnancy conditions were excluded (Wambach et al., 2011). Three

hundred ninety participants were placed in one of three groups: experimental (*n*=128); attention

control group (which received the same intervention, just not related to breastfeeding (*n*=128);

and usual care (*n*=134).

The intervention in the Wambach et al. (2011) study consisted of supporting the

adolescent mother through classes and follow-up phone calls from a team made up of a lactation

consultant and a peer counselor (who herself was a breastfeeding teen mother). Participants were

encouraged to bring a support person to the classes. In the end, 201 participants (69.5%) initiated

breastfeeding and continued in the study for as long as they were still breastfeeding; the

intervention provided was prenatal, in-hospital, and postpartum support as well as phone calls

from peer counselors (Wambach et al., 2011). Inspection of the findings suggests a significant association between the intervention and breastfeeding duration, but not breastfeeding initiation or exclusive breastfeeding (Wambach et al., 2011). The authors' conclusions are that this intervention was partially successful in supporting a developmentally sensitive educational approach to promoting positive breastfeeding outcomes for adolescent mothers and their babies (Wambach et al., 2011). The findings suggest that social support is an important part of breastfeeding success and supports the use of the Ecological Systems Theory as the framework for the proposed study.

     Critique. A review of the literature was performed by searching for scholarly articles using key words female, adolescent, prenatal, education, and breastfeeding; the studies identified were reviewed for their strengths and limitations. The Dykes et al. (2003) study had a small sample in a specific cultural context (England) and it was also conducted eleven years ago, so replication in different geographical settings and a larger adolescent population would be beneficial. The sample in the Mossman et al. (2008) study included adolescents aged 15-17 years, slightly younger than the sample in the proposed study. Wambach et al. (2011) used self-reports which can contribute to response bias or recall bias. The Wambach et al. study also had attrition issues due to no baseline data provided, withdrawal from the study, non-adherence to the intervention, loss to follow-up, did not receive calls, or experienced one of the exclusion criteria which included multiple gestations, preterm labor and birth, and giving birth to an infant with medical conditions that required admission to the neonatal intensive care unit (Wambach et al., 2011). The participants in the Wambach et al. study were provided between $10 and $20 for participation in the study and that may have influenced reports of having continued breastfeeding

in order to receive those incentives. Finally, the knowledge measure was new and should be further tested for reliability (Wambach et al., 2011).

Summary. The evidence related to adolescent breastfeeding was reviewed and several limitations were found. The strength of the evidence that was provided was mostly based on scientific processes and is therefore "level 1" or "level 2". The evidence, though quite limited, was determined to have quality ratings of "A", "B", and "C" based on the consistency of the results, sample size, and conclusions drawn. In general, examination of the evidence suggests that adolescents have educational and support needs that are different from adults, and therefore need developmentally appropriate interventions related to breastfeeding education with multidimensional support available (Feldman-Winter & Shaikh, 2007; Wambach, et al., 2011).

Prenatal text messaging

Theoretical. Breastfeeding educational strategies currently range from standard care practices with no specialization in terms of developmental age of the patient to an educational team approach focused on adolescents with peer counselors and other types of social support (Wambach, et al., 2011). Breastfeeding education for the adolescent population must take into consideration their developmental and social support needs (Grassley, 2010) so as to positively influence their attitudes towards breastfeeding (Mossman et al., 2008) and maximize their potential for breastfeeding success. This may be accomplished by creating a prenatal text messaging intervention that incorporates an adolescent's preferred means of communication with the social support they need by including people important to the adolescent into their pregnancy experience.

Empirical. A review of the literature was performed by searching the literature using key words female, adolescent, prenatal, text messaging, and intervention. The search resulted in 9 "top results" which were relevant to the proposed study and will be addressed in greater detail.

The CDC's Text4Baby program was launched in February 2010 (Jordan et al., 2011; Whitaker, Matoff-Stepp, & Rhee, 2012). Researchers at the National Latino Research Center (NLRC) at Cal State San Marcos conducted a survey among Text4Baby participants and inspection of those findings suggests high satisfaction ratings, especially among Spanish speaking women (NLRC, 2011). In addition, participants in the program reported increases in knowledge of warning signs (75.4%), communication with healthcare providers (71.3%), and maintaining scheduled appointments and vaccinations (63.1%) (NLRC, 2011).

Evans, Wallace, and Snider (2012) conducted a randomized pilot evaluation of the Text4Baby program to determine its efficacy. Specifically, this pilot study examined the relationship between Text4Baby message exposure and beliefs as program outcomes. The sample consisted of predominately Hispanic women ($n=123$) with an average age of 27.6 years. The intervention group received Text4Baby messages and usual care, and the control group received usual care alone. Social Cognitive Theory (Bandura, 1977b; 1991) and the Health Belief Model (Rosenstock, Strecher, & Becker, 1988) were used to predict behavior change related to health, health care beliefs, practices, and behaviors. The data collected consisted of responses from a 24-item survey with questions related to participant attitudes and behaviors concerning nutrition, smoking, health information-seeking, and demographic information. Variables focused on the text messages delivered by the Text4Baby program included recall, reactions, and receptivity to the messages. Inspection of the findings suggests that the Text4Baby program was associated with improvement in the mothers' belief that they were prepared to be

mothers. The participants were older than the participants in the proposed study but these findings are important because while prenatal text messages help mothers feel that they are prepared to be mothers, they may also help mothers feel prepared to breastfeed.

Fitzgerald (2012) conducted a review of the literature on evidence-based practices for tobacco cessation with an emphasis on pregnant Latina women. Inspection of the evidence suggests that the use of technology to educate young Latina women about smoking issues or to provide social support holds promise. However, Fitzgerald points out that because better access to technology is needed by the Hispanic population nurses must first assess the patients' access to technology before including technology-based interventions to them. The findings suggest that fifty percent of young Latinos text friends daily, so the author concludes that text messaging may be a helpful strategy for tobacco cessation among Latino adolescents (Fitzgerald, 2012). This has relevance to this proposed study because while the focus is on breastfeeding and not on tobacco cessation, the sample may include members of the Hispanic population.

Green et al. (2013) described the use of a new program that was developed at the Eleventh Street Family Health Center at Drexel University that built on the Text4Baby program. This program encouraged health information seeking among pregnant women through the delivery of text messages that had embedded links to web sites for further information. Green et al. suggest that the use of cell phone access to the Internet has many implications in helping patients manage health care information. Green et al. express how nurses have long been engaged in health promotion and education, and that smart phone technology has opened the door to new possibilities for supporting those efforts, especially for underserved populations. The participants indicated in general that they found the text messages useful, interesting and relevant and even demonstrated this when they met as a group, through shared Internet links about fetal

development and conversations about the benefits of having received the text messages (Green et al., 2013). The authors' conclusions are that text messaging is an efficacious and cost-effective way to promote positive health outcomes for the prenatal population (Green et al., 2013). Inspection of the findings may therefore provide support for the feasibility and efficacy of the Whispers2Mom intervention.

Lavender, Richens, Milan, Smyth, and Dowswell (2013) conducted a systematic review by searching the Cochrane Pregnancy and Childbirth Group's Trials Register and reference lists of all intervention studies to examine the effects of telephone support during pregnancy and the early postpartum period (6 weeks) as compared to usual care practices (no telephone support), on maternal and infant outcomes. The selection criteria included 27 randomized controlled trials that involved a total of 12,256 women. The trials included telephone support in any form: two of the studies had automated text messages; seven of the studies addressed breastfeeding continuation; seven studies addressed smoking cessation; two studies addressed postpartum depression; and two studies addressed preterm birth. The rest of the studies offered interventions related to general health topics, education, advice, and support.

Inspection of the study findings focused specifically on the effect of telephone support on breastfeeding mothers failed to show consistent results, although examination of the evidence suggests that telephone support (not necessarily text messaging) may increase breastfeeding duration, with no clear evidence that interventions had a positive effect on the number of women breastfeeding at six weeks postpartum (Lavender et al., 2013). The authors concluded that there was also no strong evidence for the use of telephone support in promoting successful smoking cessation outcomes. There was evidence from two trials that women at risk for depression who received telephone support had lower depression scores in the postpartum period (Lavender et

al., 2013). The authors' conclusions overall though were that the results were inconclusive and inconsistent, and that there was insufficient evidence to justify the use of resources for telephone support in prenatal health care services (Lavender et al., 2013). The findings emphasize the need to determine the efficacy of the Whispers2Mom intervention in achieving positive breastfeeding outcomes among adolescents.

Dalrymple, Rogers, Zach, Turner, and Green (2013) conducted a study to explore the feasibility of using text messages to encourage adolescents ($n=31$) to locate health information during pregnancy. The intervention consisted of a list of text messages similar to those of the Text4Baby program (adopted as a standard of care for the participants) and created from topics presented at their prenatal classes and prenatal care visits. The text messages were designed to come from the director of a health center located in a public housing development that serves a low-income, mostly minority population. Links to the Internet source of the information contained in the text message were embedded in the message itself. This allowed the participant to click on the link, and in that way, they experienced a search for more information about the health topic presented in the text message which was sent twice weekly on the days when they were not receiving text messages from the Text4Baby program. Inspection of the findings suggests that most participants reported they accessed the messages and found them to be helpful which has relevance for this study because adherence to the intervention will be measured with the Whispers2Mom Adherence Survey.

Pollak et al. (2013) assessed the feasibility, acceptability, and preliminary efficacy of a short message service (SMS) text-based intervention in a 2-arm design. The sample consisted of 31 participants in their second trimester. The SMS-delivered messages were focused on helping smokers quit or reduce their smoking. The SMS-delivered support messages group was

compared to an intervention that included SMS-delivered support messages plus a scheduled gradual reduction (SGR) to help women reduce their smoking. Efficacy was determined by a scheduled gradual reduction (SGR) in smoking. Women in the SGR group were asked to smoke only when they were sent text messages to do so. Inspection of the findings suggests that most women (86%) in the study regardless of which group they were in reported reading almost all of the text messages. Both groups also rated the program positively. Inspection of the findings suggests that women reduced their smoking with more reduction in the SGR arm (SGR arm: $M = 16$, $SD = 11$ vs. support messages only: $M = 12$, $SD = 7$). The authors' conclusions were that the SGR intervention may help women be more successful in reducing their smoking behaviors (Pollak et al., 2013). This study has relevance to the proposed study in terms of adherence to the intervention.

Naughton, Jamison, and Sutton (2013) collected data through semi-structured interviews and focus groups on 33 pregnant women who received either pregnancy-related smoking cessation text messages or no texts at all. The participants ranged in age from 16 to 40 years old with 30% of the participants being in the 16-19 years old range. The data collected were analyzed using thematic analysis and three themes emerged: ease of use, expectations, and perceived source. Inspection of the findings suggests that the participants viewed the text messages as being convenient, that the text messages were helpful and supportive, and that the more personal the text messages were, the more beneficial they would be (Naughton et al., 2013). The authors' conclusions were that this study provides evidence that participants are more engaged when the text messages have relevance to them (Naughton et al., 2013) and supports the idea that text messages should be focused on the specific needs of adolescents. The

Whispers2Mom prenatal text messaging intervention will take these findings into account in developing text messages that are developmentally appropriate to adolescents.

Moniz et al. (2013) conducted a randomized, controlled trial with 204 pregnant women (age 15-40 years) over two consecutive influenza seasons at an outpatient clinic in Pennsylvania. The control group received twelve text messages per week about general preventive health topics, and the intervention group received twelve text messages per week about general preventive health topics including influenza vaccination in pregnancy. In addition, both groups received usual prenatal care (Moniz et al., 2013). Inspection of the findings suggests that there were no differences between groups on the rate of immunization among study participants (32% rate overall, with control 31% versus intervention 33%; difference 1.7%; 95% confidence interval -11% to 14.5%) (Moniz et al., 2013). The participants acknowledged that there may be a number of different reasons for not receiving the influenza vaccine, including: not liking the shots; being afraid of side effects; and having had a bad experience with flu vaccine(s) in the past (Moniz et al., 2013). The authors' conclusions were that in spite of the lack of a change in behavior as evidenced by a positive effect on vaccination rates, the participants reported satisfaction with receiving the text messages and found them to be helpful (Moniz et al., 2013). This emphasizes the need to determine the efficacy of the Whispers2Mom intervention.

Critique. A review of the literature was performed by searching for scholarly articles using key words female, adolescent, prenatal, text messaging, and intervention; the studies identified were reviewed and limitations were identified.

The Moniz et al. (2013) study included adolescents but were not specifically focused on that population. The Pollak et al. (2013) study was also not focused on adolescents, but it was able to provide some support for the feasibility, acceptability, and efficacy of a text messaging

intervention designed to help pregnant smokers quit or reduce their smoking. Dalrymple et al. (2013) used self-reports and a financial incentive in the form of a $20 gift card which may have influenced participants and introduced response bias Evans et al. (2012) report more than expected attrition (over 50%) between baseline and follow-up resulting in a sample that consisted of more unmarried and unemployed participants and fewer participants in school, which may have influenced the intervention effects and reduced statistical power.

The Fitzgerald (2012) literature review did not provide specific information about the ages of the participants in the studies examined. Naughton et al. (2013) used a sample that involved self-selection which may have resulted in biased findings. Another limitation was that a small number of text messages were provided before the focus group/interview took place; this model may not have been enough exposure to the texts before discussing them (Naughton et al., 2013). Lavender et al. (2013) did not specify what type of telephone support options were examined, and included all types (verbal or text messaging) which may limit the ability to translate the findings to practice. The Green et al. (2013) article was from a scholarly, peer-reviewed publication (Journal of Pediatric Nursing); however, the article was written as a descriptive summary of an enhanced Text4Baby program for their Technology Column, and was not presented as a research article. The NLRC (2011) article was not from a scholarly, peer reviewed source but rather was a press release from the California State University San Marcos Office of Communication.

Summary. The strength of the evidence related to adolescent text messaging use was reviewed and found to be representative of all three levels (1, 2, & 3). In addition, the quality rating was from high quality to low quality due to methodologic flaws making the ability to draw conclusions difficult. In general, the studies were supportive of text messaging as an intervention

for promoting prenatal health and wellness in terms of user satisfaction. The information obtained in these studies is important because it helps inform nursing science and the proposed study of the feasibility of using text messages to address educational needs of pregnant adolescents in particular.

Summary of Adolescent Breastfeeding

The members of the adolescent population are in need of knowledge and support while they meet the challenges of a pregnancy coupled with the challenges of their developmental stage. It is important to note that the Text4Baby program is not geared for adolescents. While there are exciting preliminary results from data collected from the Text4Baby program, there are no reported outcomes specific to the adolescent population. For this reason, while a prenatal text messaging program may hold promise as an important adjunct to adolescents' regular prenatal visits. But based on the preliminary findings, there needs to be more research to address specific outcomes for this population. This presents an opportunity for nurses to explore the efficacy of an intervention that has appeal for the adolescent population and may have the potential to improve adolescent breastfeeding rates. This research will examine breastfeeding outcomes, related to Whispers2Mom, a prenatal text messaging intervention aimed specifically at adolescents. The intervention will include delivering text messages every day, with one of the text messages each week dedicated to breastfeeding educational topics to increase adolescent breastfeeding rates.

<div align="center">

Breastfeeding Intention

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Intention is an important concept related to breastfeeding. The relevance of breastfeeding intention is considered in the context of extant literature and this proposed study.

Theoretical. Breastfeeding intention is defined as a quantification of the intent to engage in breastfeeding behaviors (Nommsen-Rivers & Dewey, 2009) and is considered a good predictor of breastfeeding initiation which is defined as ever having breastfed/ever given breast milk (Amir & Donath, 2007). The concept of breastfeeding intention is relevant to nursing knowledge because it has the potential to inform nurses about mothers' breastfeeding decision-making in general and adolescent breastfeeding decision-making in particular (Humphreys, Thompson, & Miner, 1998). Inspection of the evidence suggests that 50-90% of pregnant women decide how to feed their infants either before becoming pregnant or very early in their pregnancy (DiGirolamo, Thompson, Martorell, Fein, & Grummer-Strawn, 2005) and that adolescents have positive attitudes about breastfeeding; however, they have been consistently shown to have misconceptions about what breastfeeding entails (Goulet, Lampron, Marcil, & Ross, 2003). For the purposes of this study, breastfeeding intention will be measured by the IFI (Nommsen-Rivers & Dewey, 2009) administered at 20 and 30 weeks gestation.

Empirical. A review of the literature was performed using key words female, adolescent, and breastfeeding intention. Six studies were identified but three were eliminated as they were from countries other than the United States. One was not applicable due to differences in ages of the sample. The remaining two studies were reviewed and will be discussed in further detail.

Dyson, Green, Renfrew, McMillan, and Woolridge (2010) conducted a mixed methods study using a questionnaire based on the Theory of Planned Behavior (Ajzen, 1991), and focus groups to explore the moral factors influencing the infant feeding decision-making process for low-income adolescents in England. Quantitative data were collected from adolescents ($n=$ 7**1**, aged 16 to 19.99 years) on breastfeeding intention using a measure that indicated responses that ranged from breast milk only to formula milk only (Dyson et al., 2010). The four focus groups

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were made up of 17 adolescents in all (aged 16 to 19 years), and employed open-ended questions in the discussion of formula feeding and breastfeeding (Dyson et al., 2010). Examination of the findings suggests that moral norms is the Theory of Planned Behavior (Ajzen, 1991) variable most likely to negatively impact adolescent breastfeeding, but not women 20 years and older (Dyson et al., 2010). The authors' conclusions are that adolescents are negatively impacted by the belief that breastfeeding is an immoral behavior, especially in public, and these beliefs must be addressed in order to increase rates of adolescent breastfeeding (Dyson et al., 2010). The Dyson et al. study helps inform the proposed study because inspection of the findings suggests that adolescents are negatively impacted by certain beliefs which may be addressed in the context of the Whispers2Mom text messages.

Giles, Connor, McClenahan, and Mallet (2010) explored young people's motivations and intentions to breastfeed using the Theory of Planned Behavior (Ajzen, 1991) with an aim of designing an intervention to promote adolescent breastfeeding. A cross-sectional survey was conducted with 2021 male and female students, 10 to 14 years old in Northern Ireland. The survey had four sections that collected information related to: demographics, previous exposure to breastfeeding, acceptance of breastfeeding, and constructs from the Theory of Planned Behavior (Ajzen, 1991) including attitude, subjective norms, and perceived behavioral control. Inspection of the finding suggests that almost two-thirds of the sample (65.5% of females; 69% of males) appear to be motivated (expressed an intention) to breastfeed or encourage their partner to breastfeed in the future (Giles et al., 2010). The students were motivated to breastfeed or provide breastfeeding support by having been breastfed as an infant (31% females; 24% males), having had previous exposure to breastfeeding (68% of females; 55% of males), and having had previous infant feeding classes (17% of females) (Giles et al., 2010). There were no significant

differences on intention to encourage their partners to breastfeed among the 10% of males who had previous infant feeding classes as compared to those who had not had infant feeding classes (Giles et al., 2010). The authors conclude that the TPB constructs of attitudes to breastfeeding, social support, and self-efficacy along with having been breastfed as a child contributed most significantly to the prediction of intention to breastfeed (Giles et al., 2010). The study was reviewed even though it was from Northern Ireland and study participants were younger than those in this study because it can provide information about breastfeeding observational experience and breastfeeding intention of early adolescents who eventually become late adolescents.

Critique. A review of the literature was performed by searching for scholarly articles using key words female, adolescent, and breastfeeding intention; the studies identified were reviewed and limitations were identified. The studies used self-report data which potentially introduced response bias (Dyson et al., 2010; Giles et al., 2010). Dyson et al. (2010) provided transportation, lunch, and a small fee for the participants to take part in the study which may potentially have biased the results. The Dyson et al. study had a sample that represented more Asian adolescents than the general population which may limit the generalizability of the findings; in fact, the focus groups were white only. In the Giles et al. (2010) study, the adolescents' ages varied as well; in this case the participants were younger than the participants in the proposed study (13-14 years old).

Summary. The limited evidence related to adolescent text messaging use was reviewed. The strength of the evidence was determined to be "level 3." The quality was "C" with a number of limitations noted, making the studies at risk for bias and inaccuracies. Even though many of the studies had small sample sizes or the ages of the adolescents were not comparable to those of

the proposed study, examination of these findings suggests that opportunities to educate mothers prenatally may be a good way to promote breastfeeding intention and provide support regardless of age.

Adolescent Breastfeeding Decision-Making

Theoretical. There was no theoretical literature reviewed for this section.

Empirical. A literature review was undertaken to determine what is known about how adolescent mothers make the decision to breastfeed using the terms adolescent, decision-making, and breastfeeding. Eight studies were identified, but the following were previously reviewed in other sections: Wambach and Cohen (2009); Murimi, Dodge, Pope, and Erickson (2010); and Nesbitt et al. (2012), and two were excluded because they were not applicable to the proposed study. Therefore, three studies were reviewed and will be discussed in greater detail.

Taylor, Risica, and Cabral (2003) investigated primiparas' reasons for not breastfeeding. The authors used the 1995 National Survey of Family Growth in the cross-sectional study in which 6733 mothers ages 15-44 (*M*=23.5; *SD* 5.0) were asked specifically about their reasons for not breastfeeding and reasons for stopping breastfeeding. The data were collected by asking closed-ended, multiple choice questions. The number of women who chose to breastfeed in this sample was 48.5% (*n*=3267); the number who did not was 51.5% (*n*=3466). A review of the demographic information suggests that the women who decided to breastfeed were older and more likely to be married, had a higher socioeconomic level, and were more educated than those women who did not breastfeed (*p*= 0.001 for each variable). More white and Hispanic women breastfed and more black women did not (*p* = 0.001). Inspection of the findings suggest that the most frequently cited reason that women did not breastfeed was because they preferred to bottle feed (66.3%). The next most cited reason was that there was a physical or medical problem

(14.9%). Other reasons cited were job/schedule (9.8%), did not know how to breastfeed (4.7%), and baby refused (1.8%). The authors' conclusions are that there are issues specific to first time mothers of different ethnicities and races, and the barriers for each are different. The ages of the participants in the study are older than the proposed study but it was reviewed because it provides information that relates to primiparas.

Witters-Green (2003) examined barriers to breastfeeding for working mothers in a mixed methods study. Data were collected through structured interviews conducted with WIC (Women, Infants & Children) staff- two breastfeeding coordinators and two breastfeeding peer counselors, with prenatal surveys completed by clients ($n=423$) that addressed intentions to breastfeed, postpartum breastfeeding status, and demographics. There were four focus groups of WIC clients ($n=13$), and employer interviews ($n=14$) about their attitudes, and beliefs about employees that return to work after the birth of a baby. The ages of those surveyed ranged from 14-45 years old ($M=25$ years). The interviews, focus groups, and questionnaires were reviewed for relevant issues and these were examined for their influence on the mothers' breastfeeding decision-making process.

Inspection of the Witters-Green (2003) findings suggests that there are many different influences on a mother's breastfeeding decision-making process. Examination of the findings from focus groups suggests that at the recommendation and encouragement of healthcare providers (physicians and nurses), mothers often decide to breastfeed. However, both WIC staff and mothers shared that they did not have the highest level of confidence in the healthcare providers' knowledge or support of breastfeeding. From the mothers' perspective, there are benefits (seeing the baby, feeling relaxed) and barriers (not having an appropriate space to pump, not feeling supported by employers) to breastfeed at work. From the employers' perspective,

there was wide variation in the level of understanding of the importance of breastfeeding, the barriers to mothers who breastfeed and work, the needs of the employees who are breastfeeding at their place of employment, as well as the ability of the employers to meet those needs. Finally, the mothers described the importance of the feelings about breastfeeding of significant others in their lives; the influence of these feelings on the mothers' breastfeeding decision-making process can be positive or negative. The author concludes that breastfeeding promotion efforts should include interventions that provide support for family members who in turn can support the breastfeeding client (Witters-Green, 2003). This provides support for the use of Bronfenbrenner's (1979) Ecological Systems Theory and Johnson and Puplampu's (2008) Ecological Techno-Subsystem as the framework for this study because of the emphasis on the aspect of support within the adolescent's environment for their breastfeeding efforts.

Brown, Raynor and Lee (2011) used a descriptive qualitative design to compare the perceptions of both healthcare professionals and mothers related to factors that influence decisions to breastfeed or formula feed infants. Twenty professionals who work with mothers of young infants engaged in semi-structured interviews in which they were asked to share thoughts about why mothers chose to formula feed their infants; twenty-three mothers of infants aged 6-12 months also shared their thoughts on infant feeding (Brown et al., 2011). Interviews were tape recorded, written notes were taken, data were transcribed, and content analysis was performed on each script with themes identified and categories formed (Brown et al., 2011). Inspection of the findings suggests that there are a wide variety of influences on mothers' decisions to breastfeed or formula feed, including lack of knowledge, support, and help with difficulties (Brown et al., 2011). The researchers conclude that professionals have a good understanding of the influences affecting mothers' early infant feeding choices and that more resources need to be available to

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health professionals to adequately support mothers in their infant feeding decision-making process (Brown et al., 2011). Whispers2Mom could be one of those resources health professionals have at the ready to support adolescent mothers to make the decision to breastfeed.

Critique. A review of the literature was performed by searching for scholarly articles using key words adolescent, decision-making, and breastfeeding; the studies identified were reviewed, and limitations were identified. Two of the studies were from 2003 (Witters-Green; Taylor et al.). Brown et al. (2011) employed self-selection for their sample and because many people that were approached to participate declined for various reasons, those who did participate may not represent the breastfeeding population as a whole. Taylor et al. (2003) explain that asking a woman to describe in a single answer her primary reason for why she stopped breastfeeding may be a limitation in this study because there may be many reasons, not just one; therefore, the survey questions may not adequately reflect her feelings. The data from the Taylor et al. study originally came from a dataset obtained in 1995, which is not very recent. The Taylor et al. interviews were obtained at different time intervals in the postpartum period, with a potential for recall bias.

Summary. The evidence related to adolescent text messaging use was reviewed and the strength of the evidence was determined to be "2" and "3" with the quality rating "B" and "C." In general, even though the findings were limited by methodological flaws and samples that were not comparable to the proposed study, examination of the findings supported the idea that adolescents benefit from developmentally appropriate interventions. In addition, inspection of the findings reinforces the need to consider the impact of the environment including supportive health care providers in order to positively impact their decision to breastfeed. This in turn

provides support for the use of the Ecological Systems Theory (Bronfenbrenner, 1979) as the

framework for the proposed study.

The research studies about adolescent breastfeeding intention and decision-making

suggest that there are many different factors that affect breastfeeding decisions that are best

understood in the context of the individual. These factors are often modifiable and include:

breastfeeding intention and social support. Inspection of the research findings suggests that

existing breastfeeding promotion strategies often do not adequately address these factors;

therefore, this study will measure them.

Theoretical Framework: Ecological Systems Theory (Bronfenbrenner, 1979)

Adolescent Health

Empirical. A review of the literature was performed by searching the literature using key

words female, adolescent, Ecological Systems Theory (Bronfenbrenner, 1979), and

Bronfenbrenner Ten studies were obtained, and three were excluded because they did not

actually employ the Ecological Systems Theory (Bronfenbrenner, 1979). The remaining five

studies did have references to the Ecological Systems Theory (Bronfenbrenner, 1979) and were

related to the following topics: identity formation (Cross & Frazier, 2010); mental health (Garcia

& Saewyc, 2007), diabetic control (Liles & Juhnke, 2008); condom use (Van Home, Wiemann,

Berenson, Horwitz, & Volk, 2009); and STD risk behaviors (Voisin, DiClemente, Salazar,

Crosby, & Yarber, 2006). These studies will be examined for the ways that they applied the

Ecological Systems Theory (Bronfenbrenner, 1979) to adolescent health and the effectiveness of

that application.

Voisin et al. (2006) used the Ecological Systems Theory (Bronfenbrenner, 1979),

specifically the micro-, meso-, and macrosystems to explore detained female adolescent risk

factors associated with sexually transmitted disease (STD). The researchers recruited detained

female adolescents (n=280) from eight detention facilities in Georgia to participate in the study.

The participants were 14 to 18 years old, sexually active, willing to participate, and had a parent

who provided consent. The data were collected using audio-computer-assisted self-interviewing

to assess all self-report measures and in the process the authors felt that would decrease problems

caused by illiteracy and decrease concerns about confidentiality (Voisin et al., 2006).

Examination of the findings suggests that taken together the factors closest to adolescents

(peer, family, and teachers) and broader societal influences (gender norms), are directly related

to STD risk behaviors among sexually active detained female adolescents (Voisin et al., 2006).

The authors' conclusion was that peer effects did not take the place of family influences, as

evidenced by the fact that increased parental monitoring and family support showed a strong

inverse relationship to STD risk behaviors, after consideration of identified covariates such as

substance use and peer effects (Voisin et al., 2006). The Bronfenbrenner model (Bronfenbrenner,

1979) was a good fit for the Voisin et al. (2006) study because it helped conceptualize how

adolescents function in the context of their environment and how influences within the different

systems can be used to first understand adolescent risky sexual behaviors, and then create

strategies to address them.

Garcia and Saewyc (2007) investigated perceptions of mental health among recently

immigrated Mexican immigrants. Bronfenbrenner's ecological framework (Bronfenbrenner,

1979) provided a theoretical foundation for understanding the cultural context and environmental

influences examined in this study. The authors used a focused ethnography to explore the health-

related perceptions and experiences of Mexican immigrant adolescents (Garcia & Saewyc,

2007). Fourteen participants, nine females and five males, ages 15-20 years old (M=16.86) were

purposively recruited from two community settings, a school and a Catholic church. The researchers employed an interview guide with semi-structured, open-ended questions focused on health, behaviors, influences, experiences accessing healthcare, and demographic data (Garcia & Saewyc, 2007). Participants were given disposable cameras and were asked to take pictures that represented aspects of health as a Mexican immigrant adolescent; then they were asked to explain what the pictures represented (Garcia & Saewyc, 2007). Participant observation, field notes, and journaling were other data sources (Garcia & Saewyc, 2007). Three categories were identified from the identified themes: mentally healthy, mentally unhealthy, and promoting health (Garcia & Saewyc, 2007). Bronfenbrenner provided a strong framework for this study because the adolescents were asked to describe their health within a context of family, friends, and life circumstances. This was helpful in understanding their risk factors for mental health problems because when the adolescents emigrated from Mexico, their environments changed, and with that came challenges related to new relationships, language, and cultural norms to which they were not accustomed. Being able to place those challenges within the context of what the adolescents were experiencing may provide the information needed to design developmentally appropriate interventions to address other health needs as well.

Liles and Juhnke (2008) used the Ecological Systems Theory (Bronfenbrenner, 1979) to explore adolescent diabetic control. The authors ultimately wanted to study how the interactions that happen between adolescents and their environment, influence diabetic control. The adolescent participants (49 male and 49 female) and their mothers, 98 pairs in all, were included in the study. The adolescents ranged in age from 10 to 17 years old ($M = 12.7$, $SD = 1.8$), which is younger than the sample in the proposed study. Mothers were asked to fill out a personal data sheet which included information like the adolescent's most recent HbA1C, total number of

times the adolescent monitored his or her blood glucose over the past 14 days, adolescent's age, age of diabetes onset, adolescent's race/ethnicity, adolescent's gender, and mother's educational level. The Family Environment Scale (Moos & Moos, 1994) was a self-report measure that was used to quantify perceptions of the family environment and the ways that members of the family influence each other. The Parent-Adolescent Communication Scale (Barnes & Olson, 1985) was a self-report measure administered to conceptualize family communication. Examination of the findings suggests that family cohesiveness was related to better compliance with treatment regimens and improved diabetic control. This study was included in spite of the differences in sample ages because it used the Ecological Systems Theory (Bronfenbrenner, 1979) to understand the ways that environment plays a role in adolescent health conditions, specifically diabetic control. Stated differently, Bronfenbrenner's model provided a way to think about how an adolescent interacts with the people and things in their environment, and then uses those influences to manage his or her diabetes.

Van Home et al. (2009) used the Ecological Systems Theory (Bronfenbrenner, 1979) to explore the reasons behind multiethnic (Mexican American, African American, and White) adolescents' condom use. Van Home et al. describe how the Ecological Systems Theory (Bronfenbrenner, 1979) can help explain the condom use behaviors of adolescents, knowing that the adolescents exist within a set of interrelated domains (individual, dyad, family, society, and community) that exert a tremendous influence on them. In the study adolescent postpartum participants ($n=636$, $M=16.8$ years old, $SD=1.165$) that completed the baseline interview within 48 hours of delivery, and then completed surveys at 6 and 12 months as well. Van Home et al. used logistic regression to identify individual, dyad, family, peer, and community level factors associated with condom use at 12 months postpartum. Inspection of the findings suggests that

there were multiple factors that predict whether adolescents use condoms, that there were overlapping risk profiles that predict condom use at 12 months after delivery, and current non-use of condoms is related to past failure to use condoms consistently (Van Home et al., 2009). The authors suggest that the Ecological Systems Theory (Bronfenbrenner, 1979) was effective in providing a framework with which to predict condom use from the environmental factors affecting adolescent sexual behaviors (Van Home et al., 2009).

Cross and Frazier (2010) used Erikson's (1968) theory of psychosocial development, Bandura's (1991) social-learning theory, and Bronfenbrenner's Ecological Systems Theory (Bronfenbrenner, 1979) to explore the important issues associated with gifted students as they live and learn in a residential high school. Twenty participants in an ethics class reflected on their experiences by describing their reasons for leaving their homes to live in the residential academy. The authors explored how living and learning in a residential setting can impact the different influences on the gifted students' psychosocial development as well as how gifted students living in a residential setting are guided in their psychosocial development. Specifically the model was used to describe how adolescents experience identity formation within the context of their environment, recognizing that the school's environment has a tremendous impact on development. The authors' conclusions were that In the Cross and Frazier study the Bronfenbrenner model (1979) was effectively used to conceptualize the ways that adolescents develop in the context of their environment, while considering the impact of the different systems. Cross and Frazier concluded that while several theories may help explain gifted students' experience of residential settings, the one that is most useful for describing the external influences on the individual as they develop is the Ecological Systems Theory (Bronfenbrenner 1979). External influences therefore must also be considered in the design of the Whispers2Mom

text messages so that the adolescent may be supported as they experience identity formation in the transition to adolescent mother.

Critique. A review of the literature was performed by searching for scholarly articles using key words female, adolescent, and Bronfenbrenner; the studies identified were reviewed and limitations were identified. Many of the studies used self-report measures with the associated risks for response bias or inaccuracies (Garcia & Saewyc, 2007; Liles & Juhnke, 2008; Van Home et al., 2009; Voisin et al., 2006). Voisin et al. (2006) used a convenience sample and a cross-sectional design which has implications for causal inferences. Some of the studies (Liles & Juhnke, 2008; Van Home et al., 2009; Voisin et al., 2006) used a subset of the population which limits the generalizability of the findings. The adolescents in the Garcia and Saewyc (2007) study were self-selected and this may be a limitation in that those adolescents who did participate may feel differently from the rest of the target population. Interpretation of the findings may not be the same for other Hispanic populations or for those individuals from rural areas. Garcia and Saewyc also used an interpreter which may influence responses and the understanding of participants' meaning.

Summary. The strength of the evidence related to studies reviewed for adolescent text messaging use was determined to be a "level 3" because it does exhibit some risks for bias and inaccuracies. The quality rating was determined to be a "C." In general, the studies provide support for the use of Bronfenbrenner's (1979) Ecological Systems Theory in the design of a developmentally appropriate prenatal text messaging intervention because it takes into account the tremendous impact of the adolescent's environment in the form of social influences, especially family and peer relationships.

Adolescent Breastfeeding

Empirical. A review of the literature was performed using key words female, adolescent, Bronfenbrenner, and to narrow the search further, the term "breastfeeding" was added. The search resulted in five research studies. One study (Ickovics et al., 2011) was already reviewed in the section about group-visit models of prenatal care; however, it is included here as well from the perspective of how the Ecological Systems Theory (Bronfenbrenner, 1979) was used as a guiding framework for the study. Other studies were eliminated because they were not relevant to this study or were from another country. Only one study was therefore considered applicable to the proposed study and is discussed in greater detail here.

Ickovics et al. (2011) conducted a randomized controlled trial which included pregnant women aged 14–25 years ($n=1047$) who were assigned to standard individual care, group prenatal care or integrated group prenatal care intervention (CenteringPregnancy Plus, CP+) with a goal of reducing psychosocial risk. The Ecological Systems Theory (Bronfenbrenner, 1979) was used in the context of how the environment can impact all levels of psychosocial functioning, the individual, partners, and community (e.g. social norms). Inspection of the findings suggests that CP+ used as an intervention for those adolescents that are experiencing the most stress with increases in self-esteem, and decreases in stress and social conflict in the third trimester (Ickovics et al., 2011). Therefore, the authors conclude that integrated prevention programs that include psychosocial health may be more effective than stand-alone programs; bundling psychosocial health promotion activities with existing programs will serve to maximize their effectiveness (Ickovics et al., 2011). The Ecological Systems Theory (Bronfenbrenner, 1979) was a good framework for the Ickovics et al. study because it supports the use of the CP+

intervention from the perspective of the adolescent's microsystem, with positive support from others being provided in the stressful prenatal period.

Critique. A review of the literature was performed by searching for scholarly articles key words female, adolescent, Bronfenbrenner, and breastfeeding; and one appropriate study was identified and reviewed. Ickovics et al. (2011) used a small segment of the population, specifically young minority women at highest risk for adverse perinatal outcomes; therefore, the findings may not be generalizable to a larger more diverse sample.

Summary. The strength of the evidence obtained from the Ickovics et al. (2011) study was determined to be "level 2" and the quality rating was "B." There is very limited evidence from studies using the Ecological Systems Theory (Bronfenbrenner, 1979) with adolescents in general and adolescent breastfeeding in particular; therefore, more evidence is needed to be able to draw conclusions that it is an adequate model with which to explore adolescent breastfeeding.

Theoretical Framework: Ecological Techno-Subsystem (Johnson and Puplampu, 2008)

Empirical. A review of the literature was performed by searching the literature using key words female, adolescent, Ecological Techno-Subsystem, and Johnson and Puplampu. Two studies were identified, and both were written by one of the developers of the Ecological Techno-Subsystem (Johnson, 2010; 2011). The two studies that were identified will be examined for whether they have application in adolescent health.

Johnson (2010) used the Ecological Systems Theory (Bronfenbrenner, 1979) with its five subsystems to describe human development within immediate and distal environments as well as the interactions among and between them. Johnson expanded on the Ecological Systems Theory (Bronfenbrenner, 1979) by including one aspect of the environment that he did not, namely technology. Specifically, Johnson explored interactions between the child, family, cognitive

development, home Internet use, and socioeconomic factors. The study included parents and their children who ranged in age from 6 to 12 years old ($n=128$) from the same elementary school in western Canada. The measures for the Johnson study were: children's cognitive development (as measured by a subset of the Wechsler Intelligence Scale for Children-Wechsler, 2003); child home use of the Internet (as measured by 2 questions on the parent questionnaire); and family socioeconomic factors (as measured by 5 questions on the parent questionnaire). Examination of the findings suggests an association between father's education and three measures of cognitive development (expressive language, visual perception, and auditory memory), and mother's employment and metacognitive planning (Johnson, 2010). These aspects of the child's environment (father's education and mother's employment) may be related to how the parents communicate and interact with the child and thereby impact his or her microsystem (Johnson, 2010). Examination of the findings suggests that home use of the Internet (techno-subsystem) explained more of the variance than family characteristics (microsystem), in terms of the child's cognitive development (Johnson, 2010). The author's conclusions were that the Ecological Techno-Subsystem (Johnson & Puplampu, 2008) therefore provides a framework for understanding the impact of technology on children's cognitive development (Johnson, 2010).

Johnson (2011) explored Internet use among children ($n= 95$, $M=10.4$ years old) in a study that measured Internet use, self-esteem, and cognition. The Ecological Techno-Subsystem (Johnson & Puplampu, 2008) was developed to explain how Bronfenbrenner's microsystem (Bronfenbrenner, 1979) can be expanded to include technology as a means of communication and interaction within the individual's microsystem. Technically, the Internet can be viewed in the context of the other systems as well (mesosystem- school and family interactions using the

Internet; exosystem- parents obtaining information over the Internet about their child's school

performance while at work; macrosystem- social norms related to Internet usage) (Johnson,

2011). The study employed a sample of children from one school in western Canada (*n*=95,

M=10.4 years old) (Johnson, 2011). The questionnaire asked children about their Internet use at

home and school (6 items), self-esteem (Hare Self-Esteem Scale- Kelley, Denny & Young,

1997), and cognition. Inspection of the findings suggests similar experiences with the Internet

between boys and girls at school; at home boys and girls use the Internet to play games equally

often, while girls tend to email more than boys. As far as measures of self-esteem and cognition,

girls scored higher. The author concludes that the Ecological Techno-Subsystem is useful in

helping to explain how boys and girls use the Internet in the context of their environments

(Johnson, 2011).

  Critique. A review of the literature was performed by searching for scholarly articles key

words female, adolescent, Ecological Techno-Subsystem, and Johnson and Puplampu; two

studies were identified and reviewed, both written by one of the developers of the model. Neither

of the studies (Johnson 2010; 2011) had an adolescent sample, as in the proposed study (18-19

years old), the ages of the participants were much younger. In the Johnson (2010) study, parent

report of the child's Internet use was employed and in the Johnson (2011) study, children's self-

report was used, both of which may be inaccurate and potentially a source of response bias.

Finally, the children in the Johnson (2010) study were from the same school and therefore were

assumed to have similar Internet use experiences which may in turn influence the Internet use at

home and elsewhere. The author acknowledges that those experiences may have been very

different from class to class which can also affect the findings (Johnson, 2010).

Summary. The strength of the evidence was examined and found to be "level 3" while the quality rating was "C." The search for studies related to the Ecological Techno-Subsystem were limited to two written by Johnson, one of the developers of the Ecological Techno-Subsystem (Johnson & Puplampu, 2008), and neither study used an adolescent sample. This makes it difficult to support the use of the Ecological Techno-Subsystem as a framework for this study. However, because the Ecological Techno-Subsystem is so closely related to the Ecological Systems Theory (Bronfenbrenner, 1979) and in fact expands upon it, the proposed study will include it as a framework.

Gaps in the State of the Science

According to the U.S. Surgeon General (United States Department of Health and Human Services, 2011a):

> Although there is a body of research on breastfeeding, significant knowledge gaps are evident. These gaps must be filled to ensure that accurate, evidence-based information is available to parents, clinicians, public health programs, and policymakers. For example, more research is needed on the barriers to breastfeeding among populations with low rates of breastfeeding (p. 3).

Although breastfeeding education programs have had some success in their respective samples, prenatal breastfeeding interventions have not been consistently effective (Grady & Bloom, 2004; Lu et al., 2003; Massey, Rising & Ickovics, 2006; Noel-Weiss, Rupp, Cragg, Bassett, & Woodend, 2006; Ryser, 2004; Walker & Worrell, 2008; Zimmerman, 1999). There are gaps in understanding why many adolescents have difficulties with the initiation and maintenance of breastfeeding (Scharfe, 2012). Research suggests that the attitudes and level of knowledge of healthcare providers who provide breastfeeding support can directly impact the ability of a

mother to successfully breastfeed (AWHONN, 2007; USDHHS, 2011a). Most research about breastfeeding has not been focused on the adolescent population; therefore, further research on strategies to increase breastfeeding in adolescents is needed. The proposed study will address a gap that exists related to prenatal breastfeeding interventions in the adolescent population.

The Text4Baby program was introduced as a free mobile information service from the National Healthy Mothers Healthy Babies Coalition, to provide health information to women in all stages of pregnancy via text messages timed to the baby's gestational age (Jordan et al., 2011). "Text4Baby's power lies in its ability to get the most essential health information to mothers in need quickly and easily using a technology they regularly use and rely on" (National Healthy Mothers, Healthy Babies Coalition, 2011c). Prenatal care increases positive outcomes for pregnant adolescents by reducing risk factors through education and social support (ACOG, 2007a; 2007b; Debiec, Paul, Mitchell, & Hitti, 2010; Raatikainen, Heiskanen, Verkasalo, & Heinonen, 2006). The members of the adolescent population need patient-centered, developmentally appropriate education and support as they meet the physical, emotional, and social demands of a pregnancy coupled with the challenges related to their developmental stage.

The Text4Baby program is not geared for adolescents. While there are exciting preliminary results from data collected from the Text4Baby program (Jordan et al., 2011; NLRC, 2011), there are not reported outcomes specific to the adolescent population. Texting is an important element of adolescent identity, and more than any other group adolescents have mastered texting as a way to fill a communication need in their lives (Lenhart et al, 2010a; Purcell, 2010). Half of adolescents send more than one hundred text messages a day, and one in three sends more than three thousand text messages a month (Lenhart, et al., 2010a). For these reasons, while a prenatal text messaging program holds promise as an important adjunct to

adolescents' regular prenatal visits based on the preliminary findings (Jordan et al., 2011), there needs to be more research that examines specific outcomes for this population. Therefore, the purpose of this study is to evaluate the effect of a prenatal text messaging intervention designed to increase breastfeeding intention in a select group of adolescents.

Summary of Chapter Two

The purpose of this research is to evaluate the feasibility of a developmentally appropriate adolescent prenatal text messaging intervention, Whispers2Mom, to be used in conjunction with usual prenatal care practices. The literature review included an examination of adolescent factors influencing health behaviors including cognition, autonomy and risk-taking, help-seeking behaviors, peer relationships, communication, literacy, technology, and texting. Inspection of the evidence suggests that adolescents have less impulse control than adults, and that they take chances based on feelings rather than logical thought (Johnson et al., 2009; Lickerman, 2008). Peer relationships become more important than parental relationships during adolescence (Muuss, 2006) and adolescents are influenced by the behaviors in which their peers engage (McNeely & Blanchard, 2009).

Adolescent health education was explored in the context of the many different settings in which it occurs, including: schools, e-Health, and m-Health. Inspection of the evidence suggests that there are important interconnections between peer relations, health-related behaviors, and health status (Crosnoe & McNeely, 2008). Adolescent prenatal education was examined, especially home visits and the group visit model. Inspection of the evidence suggests that focused attention to the special needs of adolescent mothers that is nonjudgmental and developmentally appropriate can have beneficial outcomes for both mother and baby (Ford et al., 2002; Montgomery, 2006).

Adolescent breastfeeding and strategies including prenatal text messaging was also reviewed. Inspection of the evidence suggests that the themes related to experiences and areas of needed support cannot be considered irrespective of the other, and should be provided within the context of a trusting relationship (Dykes et al., 2003). Breastfeeding intention was considered within the framework of the Ecological Systems Theory (Bronfenbrenner 1979) and Johnson and Puplampu's Ecological Techno-Subsystem (2008). Finally, gaps in the science were discussed.

CHAPTER THREE

The purpose of this chapter is to describe design, sample, setting, and data analyses undertaken to answer the research questions. Although originally designed to evaluate the feasibility and efficacy of a developmentally appropriate prenatal text messaging intervention, Whispers2Mom, to be used in conjunction with usual prenatal care practices to increase breastfeeding intention in a sample of adolescents, recruitment issues precluded implementation of the original design study. The design and recruitment approached were altered. The recruitment plan was expanded several times, with the final design including young adults up to 26 years old. Issues related to recruitment are addressed in greater detail in Chapter 5. The organizations contacted during the recruitment phase for this study are summarized in Table 3. The challenges and resultant decisions about the recruitment plan are summarized in Table 4. This chapter will explain the final study design and recruitment process.

Design

The final design was a mixed- methods feasibility study which collected qualitative and quantitative data from focus groups and individual interviews to examine Whispers2Mom, a prenatal text messaging intervention to increase young adult breastfeeding intention. According to Schoonenboom and Johnson (2017), mixed methods designs employ a combination of at least one qualitative and one quantitative research component. The overall goals of the mixed methods design is to answer the research questions and strengthen the study and its conclusions (Schoonenboom & Johnson, 2017). The feasibility of the Whispers2Mom prenatal text messaging program was measured by adherence and acceptability. A feasibility study is undertaken to evaluate aspects of an intervention (Cope, 2015; Tickle-Degnen, 2013), and designed to build the foundation of a planned intervention study (Tickle-Degnen, 2013). Given

recruitment issues, this design was deemed the most appropriate to answer study research questions.

The two research questions for this study were:

1) What is the feasibility of the Whispers2Mom prenatal text messaging intervention as evaluated by participant self-report of adherence?

2) What is the feasibility of the Whispers2Mom prenatal text messaging intervention as evaluated by participant self-report of acceptability?
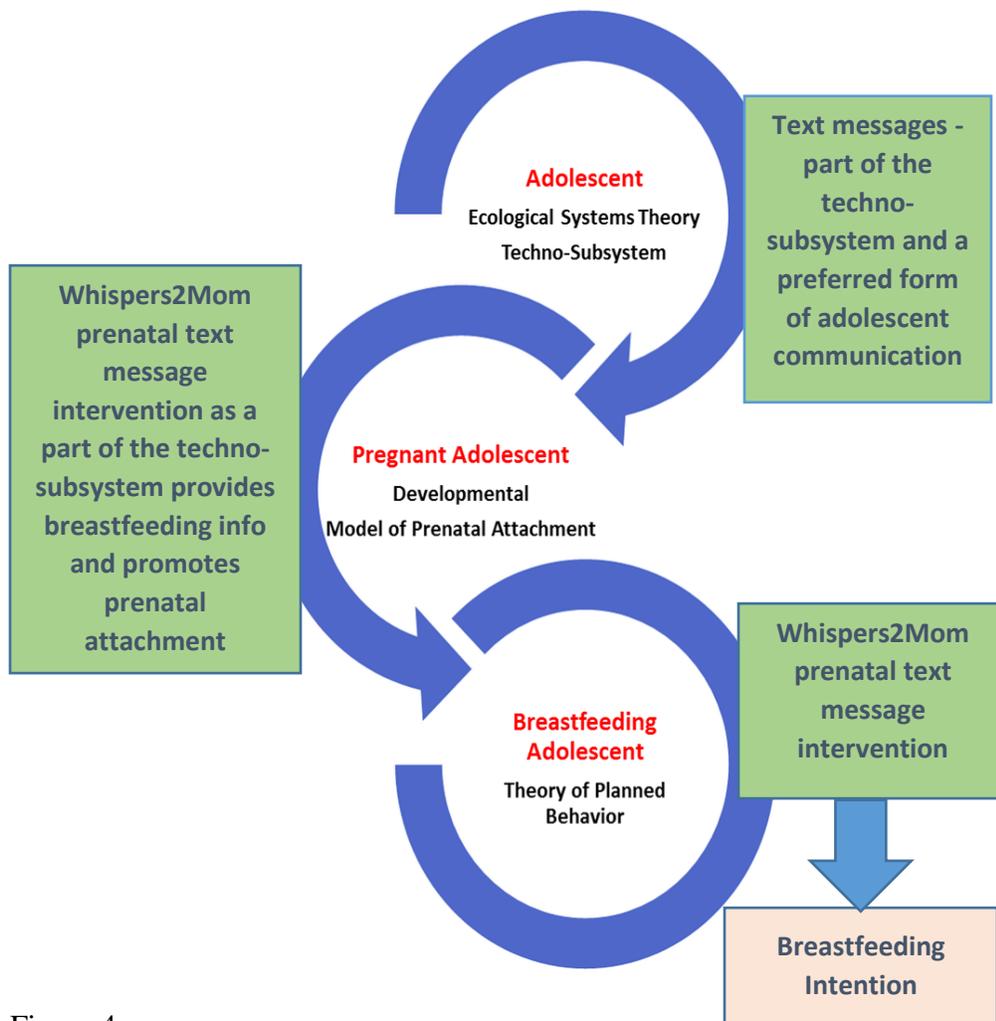
Figure 4

Interconnectedness of Theories- Final Design

Recruitment

The recruitment process began with contacting organizations that served pregnant individuals and/or breastfeeding mothers in Milwaukee County as well as the Fox Valley area of northeastern Wisconsin.

Table 3

Summary of Organizations Contacted During the Recruitment Phase

Type of Organization	Number of Organizations Contacted ($n = 50$)	Locations of Organization
Breastfeeding Organizations	5	Milwaukee, Dane, Brown, Outagamie Counties
Health Departments	7	West Allis, Cudahy, Winnebago, Appleton, Brown County, & Calumet County
Hospital Systems	10	Milwaukee, Tomah, Neenah, Appleton, Berlin, Fond du Lac, & Oshkosh
Parent Connection/ Healthy Families	5	Fox Valley, Oshkosh, Winnebago County, Brown County, & St. Croix Valley
Community Health Centers	5	Milwaukee County
Women, Infants, & Children	7	Milwaukee, Brown, Calumet, & Fond du Lac Counties
Day Cares	3	Milwaukee County
Higher Education	3	Milwaukee & Kentucky
Birth Centers	2	Milwaukee
Organizations	3	Fond du Lac, State of Wisconsin

First the facility, organization, or lead individual was contacted by email. The email was followed up by a phone call within a month. From the fifty organizations that were contacted (Table 3), two agreed to recruit participants, and another agreed to allow Whispers2Mom study brochures in the organization's waiting room. The convenience sample was recruited with the referral and assistance of the director of a pregnancy care home in northeastern Wisconsin, the director of a breastfeeding support organization in Milwaukee County, nursing students at a small, private Midwestern university, and other personal contacts. Table 4 summarizes the recruitment activities for the different phases of the study.

Table 4

Summary of Recruitment Activities for Different Phases of the Study

Phase #	Date	Description
1	11/25/15	**Inclusion criteria**: 18-19 years old, primigravida, singleton pregnancy, 17-20 weeks gestation, no prior health problems, English speaking, gives birth at term, keeping the baby, receives prenatal care. **Recruitment activities**: Sixteen organizations that served pregnant young adults in the Milwaukee and Fox Valley areas of WI were contacted by email. Two organizations (one pregnancy care home and one breastfeeding support organization) agreed to recruit participants. Brochures were distributed to Directors of the two organizations, to share with employees and volunteers, and for distribution to potential participants. Student investigator attended monthly meetings to meet potential participants. Met with faculty at a local School of Public Health, who were not able to provide participants, and suggested to try WIC offices. Began the search for additional sites for recruitment in the Milwaukee and Fox Valley areas of Wisconsin. Created a table to document communication efforts and responses. However, after 3 months of no success in terms of participants being recruited by those organizations, inclusion criteria was expanded.
2	3/01/16	**Amendment**: Age range 18-21 years old; 14-27 weeks gestation **Rationale:** expand the recruitment pool by increasing the age of the mother and gestational age of the pregnancy

Recruitment activities: Communicated expanded inclusion criteria to Directors of two organizations willing to recruit participants, revised and supplied brochures for distribution. Continued attending monthly meetings. Continued search for recruitment sites in the Milwaukee and Fox Valley areas. A local birth center explained there were no clients meeting criteria, and only 1-2 clients meet those criteria each year. Met by phone with four representatives whose agencies were unable to recruit participants. Updated the table. After about a month, no participants were identified.

3	4/04/16	**Amendment**: Expand gestational age to 17 to 26+6/7 weeks; included Facebook as a recruitment site **Rationale:** expand the recruitment pool by increasing the age of the fetus, as well as increase access to potential participants **Recruitment activities**: Widened the search for recruitment sites to include Madison, Green Bay, Tomah, Berlin, and St. Croix Valley. One client was interested in participating from one of the two organizations willing to recruit; however, she did not meet inclusion criteria for age of mother. One representative in St. Croix Valley discussed the study with the researcher, presented it to her colleagues, but the decision was made not to participate. Updated the table. Fifty organizations (Table 3) were contacted about the study, 16 replied with interest, 26 did not reply at all. Only four organizations met with the student investigator in person. Two representatives of organizations were willing to recruit, one other agreed to place brochures in the waiting room. After nearly three months, no participants were recruited.
4	6/30/16	**Study closed due to challenges with recruitment.** **New study protocol submitted to IRB, and approved.** **Inclusion criteria**: 18-26 years old, singleton pregnancy, not greater than 34 weeks gestation, speaks English, keeping the baby, owns a cell phone of their own with text messaging capability, and willing to receive text messages daily for a month. **Rationale:** The new study widened the range of both age in years of the mother, and gestational age of the fetus in order to expand the recruitment pool. **Recruitment activities**: Communicated expanded inclusion criteria to organization representatives, revised brochures, and supplied them for distribution. Widened the search for recruitment sites to include a School of Midwifery in Kentucky. Updated the table. After about four months, no participants were recruited.
5	10/31/16	**Amendment**: One-on-one interviewing along with focus groups

Rationale: increase potential participants by offering two options-focus groups and individual interviews
Recruitment activities: Three clients (breastfeeding support organization) met the inclusion criteria and were willing to meet as a focus group. Three clients (pregnancy care home) met inclusion criteria and were willing to be interviewed individually. Faculty colleagues, current nursing students, and family members were provided with brochures describing inclusion criteria. Through Facebook and word-of-mouth these individuals were able to identify eight additional people who met the inclusion criteria. Potential participants interested in the study called the student investigator, and eligibility was confirmed. Participants who agreed to be signed up by the student investigator to receive Whispers2Mom texts for a period of 30 days were enrolled in the program, and began receiving the texts. At the end of 30 days, the study visit was scheduled at the participant's convenience.

Intervention

Description

The intervention consisting of a program of text messages used in addition to usual prenatal care practices was developed by Maternal/Newborn nursing students in a baccalaureate nursing program in a small Midwestern university. The student nurses, who averaged 21-22 years of age, created the text messages as a service-learning project at the request of the Director of the local pregnancy care home for their residents, who were mostly 18 to 19 years old. The Director heard of the Text4Baby program (National Healthy Mothers, Healthy Babies Coalition, 2011a) and asked the students to create text messages to provide information about the adolescents' pregnancy experience that was more suited to the needs of that population.

The students first identified the pregnant adolescent population as needing education and information about topics related to their own health and the health and development of their babies. From there they decided that daily text messages geared to the needs of the pregnant adolescent would be a wonderful way to educate and inform, instruct and support them about

general pregnancy topics and the baby's health needs. Finally, the nursing students discussed and decided that the adolescents would respond best to the text messages if they were worded as if coming from the baby. In doing this it was thought that would help the adolescent begin to understand the baby as a separate person, which reflects the theoretical underpinnings of the Developmental Model of Prenatal Attachment (Doan & Zimmerman, 2003). According to Doan and Zimmerman (2003) conceptualizations of prenatal attachment attempt to combine behavior, cognition, and emotion in the definition they provide: "Prenatal attachment is an abstract concept, representing the affiliative relationship between a parent and fetus, which is potentially present before pregnancy, is related to cognitive and emotional abilities to conceptualize another human being, and develops within an ecological system" (p. 110). In addition, the Ecological Systems Theory (Bronfenbrenner, 1979) and Ecological Techno-Subsystem (Johnson & Puplampu, 2008) provide a developmental framework with which to understand the baby as a part of the mother's microsystem and text messages as part of the techno-subsystem. Appendix H is a table that aligns each of the text messages with the theory that supports it.

There is a developmental difference between adolescent and adult mothers in terms of social support: adolescents tend to look to external sources of positive feedback and affirmation in order to promote their identity and assimilate new roles, as compared to adult mothers who most likely have already done that (Nesbitt et al., 2012). The text messages, which provide education and positive feedback about healthy behaviors while helping the adolescents learn about their new role as a mother, may therefore be considered a source of social support in this study.

Adolescent breastfeeding rates are declining in contrast to the breastfeeding rates of other age groups (Nelson, 2009). In doing their research on the topics of interest to pregnant

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adolescents, the nursing students recognized that the breastfeeding rates of mothers under 20 years of age (43%) are much lower than are the breastfeeding rates of mothers who are age 20-29 years old (65%) or 30 years and older (75%) (McDowell et al., 2008). The nursing students identified breastfeeding as a particularly important topic about which the adolescents should learn. Therefore, an emphasis was placed on providing text messages about the benefits of breastfeeding as well as strategies and behaviors to promote breastfeeding success.

The Theory of Planned Behavior (Ajzen, 1991) was included in the final framework because of the focus on breastfeeding intention, and with its emphasis on behavioral, normative, and control beliefs was a better fit (Ajzen, 2006). In addition, it has been noted that the Text4baby program used theoretical constructs from a number of behavioral theories, including the Theory of Planned Behavior (Ajzen, 1991), to guide the development of the intervention (University of Maryland School of Public Health, 2014). The Whispers2Mom texts were based on topics addressed in the Text4baby program (Wellpass, 2017). Appendix G details the individual texts by week highlighting those that are breastfeeding-related. Non-breastfeeding related topics addressed fetal growth and development, maternal self-care, nutrition, injury prevention, sleep, safety, and warning signs of potential pregnancy problems, etc. Text messages sent everyday provided constant exposure to text messages. While few studies have explored how often health-related text messages should be sent, the evidence suggests that more exposure to the text messaging intervention provides significant effects (Evans et al., 2014; Evans et al., 2015).

Content Validity

Accurate content in the text messages is an important point in determining if the text messages are adequate, error-free, educational in content, and represent the information needed

by adolescents to make informed decisions about their health, especially breastfeeding. Two certified nurse midwives, one certified lactation consultant, and an adolescent expert validated the text messages for accuracy. The judges were instructed to use Appendix F to review each of the individual text messages for relevance, clarity, and accuracy in representing the pertinent information (Waltz, Strickland, & Lenz, 2005). The text messages were judged using a four-point scale: (1) not relevant/clear/accurate; (2) somewhat relevant/clear/accurate; (3) quite relevant/clear/accurate; and (4) very relevant/clear/accurate (Waltz et al., 2005). The content validity index (CVI) measured the degree of agreement between reviewers (Waltz et al., 2005).

Each of the 168 text messages were reviewed using Appendix F for relevance, clarity, and accuracy. The information was then reported to the researcher. All the reviewers judged the individual text messages to be quite/very accurate. The CVI for the text messages was calculated as the proportion of the total number of items judged to be content valid (DeVon et al., 2007). The CVI for the question about relevance of the text messages was 4, very relevant. The CVI for the question about clarity was 3.67, quite/very clear. The CVI about accuracy was 3.67, quite/very clear. In summary, the reviewers judged theWhispers2Mom prenatal text messages to be relevant, clear, and accurate for the adolescent population.

Reading level

The reading level of the text messages has been verified by the Microsoft Office Word 2010 program which is designed to display information about the reading level of the document, including readability scores according to the following tests: Flesch Reading Ease and Flesch-Kincaid Grade Level. The Flesch/Flesch-Kincaid tests use word length and sentence length to suggest the readability of a document. The Whispers2Mom prenatal text messages were therefore examined by applying this option in the Microsoft Word program: the Flesch Reading

Ease score was 88.0. To give an example of what the readability results means, the average 6th grade student's written assignment has a readability of 60-70. The Flesch-Kincaid Grade Level score was 4.7; this means that it would take 4.7 years of education to understand the text messages.

Implementing the intervention: Interested individuals that met the inclusion criteria contacted the student investigator. After eligibility was confirmed, and the study was explained, participants were invited to participate. If they agreed, the gestational age of the baby was determined using the participant's due date. The investigator enrolled the participants into the Whispers2Mom program. The participants received text messages appropriate to the baby's gestational age over the next month. Participants may not have received exactly the same texts, because the texts were specific to the gestational age of their baby; however, the same number of texts (i.e., 30) was received. The intervention was set up so that participants received five texts related to pregnancy in general, and two texts related to breastfeeding each week. The breastfeeding texts were placed randomly among the texts.

Measures

Demographic Data Form (Appendix C). The nine question Demographic Data Form was used to characterize the sample's demographics. The questions asked about age, ethnicity, educational level, relationship status, employment status, and enrollment in social programs like WIC, BadgerCare, and Text4Baby, etc.

Whispers2Mom Survey Questions. The Whispers2Mom Survey Questions form was designed to explore participant experience receiving the texts in terms of how pleasing (or not) the texts were, how easy or difficult they were to use, and how they met the participants expectations. This instrument had five questions, written on a Likert-type scale with responses

ranging from "not at all" (1) to "somewhat" (5-6) to "very" (10). Participants were instructed to choose one response (0-10) for each question, on the scale of 1 to 10. The dissertation committee reviewed the instrument prior to implementation and confirmed that it measured what it intended to do.

Infant Feeding Intentions Scale (IFI) (Nommsen-Rivers & Dewey, 2009) (Appendix S). This scale is a quantitative measure of maternal breastfeeding intentions. The participant was instructed to choose the answer that most closely matches their opinion about feeding plans and the likelihood of carrying out those plans. Cronbach's alpha was $\alpha = .90$ in two separate samples used to develop the scale (Nommsen-Rivers & Dewey, 2009). The strength of intention based on the total scale score was as follows: a) very low (0-3.5), b) low (4.0-7.5), c) moderate (8.0-11.5), d) strong (12.0-15.5), and e) very strong (16.0) (Nommsen-Rivers & Dewey, 2009). Cronbach's alpha was calculated for the Whispers2Mom study to be $\alpha = .39$

Data Collection

Upon arrival at the site of their choosing, the participants were welcomed, and the study was discussed. Consents were read and explained, and any questions were answered. The consents were then signed by the participants. The Demographic Data Form, Whispers2Mom Survey, and Infant Feeding Intentions Scale were completed next. Finally, instructions were given for the focus group and individual interviews. The interview questions were then provided.

Focus groups. Qualitative researchers rely on focus groups to collect data from multiple individuals simultaneously (Onwuegbuzie, Dickinson, Woodring, Leech, & Zoran, 2009). Foley, Rado, Brown, and Hamner (2006) describe a focus group as a relatively planned discussion among a small group of people about a topic. The focus group uncovers a range of perceptions about experiences that are relevant to answering research questions, and are often used in an

exploratory manner that informs the design of larger studies (Woodring et al., 2006). A facilitator guides the focus group based a set of topics that are pre-determined (CDC, 2008). The research question and research design guide how the focus group is constructed (Onwuegbuzie et al., 2009). According to Powell and Single (1996), focus groups are made of between six and ten individuals who are strangers to each other and share characteristics important to the study. The size of the group and fact that participants do not know each other encourages an environment in which honest discussions can take place, even when the experiences are negative (Powell & Single, 1996). Focus groups should be big enough to yield diverse data, but not so big that the participants are not comfortable in sharing their thoughts (Onwuegbuzie et al., 2009).

In the Whispers2Mom study, three individuals from one breastfeeding organization in Milwaukee County agreed to participate in a focus group. These individuals did not know one another. On the agreed-upon day, one participant arrived on time, one arrived about ten minutes late, and another did not come at all. The participant who arrived late explained that her grandmother was in the hospital and she was going there to see her after the focus group. During the focus group, she answered two or three phone calls from relatives about the grandmother. The participant who did not show up was called but did not answer. Later she explained that she worked the night before and slept through her alarm. This participant later arranged a day, time, and place to meet for an individual interview. The Whispers2Mom Focus Group/Interview Guide (Appendix M) was used to welcome the participants, introduce the study, provide instructions, and organize the questions.

Individual interviews. Individual interviews are a common and invaluable way to gather data about the meaning of an event, situation, or social context for individual participants (Fox, 2006). The quality of the data collected will vary according to the interview design and the skill

of the researcher (Fox, 2006). Semi-structured interviews have topics or questions that have been planned in advance and are open-ended (Fox, 2006). The interviews provide a variety of different stories and information, and the intimate nature of an individual interview allows for sharing topics that are uncomfortable or sensitive (Fox, 2006). Face-to-face interviews are the most common, a method by which the researcher and participant meet together (Fox, 2006). In-depth interviews are intensive individual interviews with a few respondents to explore their individual perspectives on a particular idea (Boyce & Neale, 2006). The primary advantage of in-depth interviews is that they provide more detailed data than other methods, like surveys (Boyce & Neale, 2006). They are suitable for distinguishing individual opinions and are often used to refine questions for future surveys (Boyce & Neale, 2006). The individual interview approach assumes that if the questions have been formulated correctly, then participants will use their words to describe their experiences and that will reflect their reality (Lambert & Loiselle, 2008). Interviewees may choose to withhold information or embellish their perspectives in order to represent their preferred self-image, or to impress the interviewer (Lambert & Loiselle, 2008). Interviewers may also bias the findings by demonstrating a stance that favors a certain perspective, instead of maintaining neutrality (Lambert & Loiselle, 2008).

Twelve of the Whispers2Mom participants preferred to meet as individuals. The participants chose the day, time, and setting for the meeting. The locations varied from coffee shops to restaurants to the individual's home. This meant that the environment was not always quiet and conducive to a conversation, but the equipment was able to record the interview well enough to understand and create a verbatim transcript. The individual interviews each lasted about an hour.

The steps in conducting the focus groups and individual interviews followed the same format as outlined in the Whispers2Mom Focus Group/Interview Guide (Appendix M). The difference was that in the focus group there was interaction among participants. Interaction data resulting from participants questioning one another, and commenting to one another can enrich the data through increasing the depth of the inquiry and uncovering aspects of the topic that might otherwise go unnoticed (Lambert & Loiselle, 2008). In the Whispers2Mom study, the two participants in the focus group spent a considerable amount of time talking to each other as well as the investigator, about the interview questions and other unrelated topics. When this happened, the investigator would take efforts to redirect the participants back to the interview questions. Once the interview was completed, participants received a $25 gift card to Walmart®.

Data Analysis

The Whispers2Mom mixed-methods study employed quantitative descriptive statistics and qualitative thematic analysis. Quantitatively, demographic data were collected along with the Whispers2Mom Survey and the Infant Feeding Intentions Scale. Qualitative research traditions are similar in that they try to arrive at an understanding of a phenomenon from the perspective of the person experiencing it (Vaismoradi, Turunen, & Bondas, 2013). Thematic analysis is one of several different research methods that can be used to analyze text gathered through interviews and focus groups (Vaismoradi et al., 2013). Thematic analysis provides a rich and detailed examination of the data, identifying common themes across individual interviews or a whole data set (Braun & Clarke, 2006; Vaismoradi et al., 2013). Braun and Clarke (2006) provide the steps for how to conduct a thematic analysis. The process will be described in the following paragraphs.

The thematic analysis process is flexible in that it can be used to answer most research questions, works with most types of qualitative data (including interview data), and across the different approaches to conducting qualitative research (Braun, Clarke, & Rance, 2014). Thematic analysis begins with a careful examination of data by creating a transcript derived from listening to the audio recording to understand the content. The next step involves reading and re-reading the transcripts as a basis for the analysis. Braun and Clarke (2006) describe thematic analysis as a research method in which the content of text data is subjectively interpreted by coding and identifying themes and patterns in the data.

The Whispers2Mom study data were collected with one focus group consisting of two participants and twelve individual interviews, for a total of fourteen participants. The research questions in this study asked about people's experiences with the Whispers2Mom text messages. Inductive thematic analysis is used in cases where there are no previous studies dealing with the phenomenon and so codes, subthemes and themes are driven by the data (Hsieh & Shannon, 2005; Vaismoradi et al., 2013). Thematic analysis was used inductively in the Whispers2Mom study in the sense that the coding and theme development were guided by the content of the interviews (Braun et al., 2014). These qualitative approaches were used to learn not only what the participants thought about the text messages, but also how they made meaning of their experiences with the Whispers2Mom program, within the context of the research questions.

Interview thematic analysis process. Step #1 in the thematic analysis process began immediately after the interview. This first step involved repeatedly listening to the audio recording in its entirety, and then word-by-word to create the transcripts. The recording was transcribed verbatim, and all names were redacted to protect participant confidentiality. The individual lines of the interview were double-spaced, and numbered. There were margins at

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either side for making notes. The actual number of times the audio recordings were listened to varied according to the quality of the sound for each interview. The volume of the background noise often made the transcription process a challenge. The completed transcripts were each read over in their entirety a minimum of three times. A short description of the environment and any other pertinent details were included at the top of the transcript. A separate document was created for each participant interview.

Step #2 in the analysis process was when key words were identified from the texts that represented important thoughts or ideas. As the process continued, labels for codes were identified directly from the text that appeared to be reflective of more than one thought and which become the initial coding scheme (Hsieh & Shannon, 2005). The data were organized into meaningful clusters for each one of the interview questions, using a table with two columns to identify and code all the participants' responses for that question in one place. Codes originated from the participants' words, phrases, or sentences and were used to describe the meaning of what the participant said. Coding allowed large amounts of data to be broken down into relevant and more manageable parts in a systematic and intuitive process (Vaismoradi, Jones, Turunen, & Snelgrove, 2016). After reading a few of the interview transcripts, codes began to emerge that were then applied to the rest of the transcripts. As new codes were identified, the previous transcripts were reviewed to see if the new codes applied to that text as well.

At the beginning of the coding process, the focus was broad and, over time, became narrower to identify themes. The interview question was placed at the top of the table. The interview was transcribed with the participant's response placed in the large left-hand column of the table. The words were identified as spoken by either the participant (P) or researcher (C). The different responses were separated by horizontal lines and color-coded for each participant. The

smaller right-hand column was used for codes identified from the participants' words. When looking at the different codes, it became clear that some codes could be combined, based on the similarity of their meanings.

Step #3 in the analysis process included organizing the interview data for each question across all participants in a table with three columns. The horizontal lines and same colors were used to separate the participant responses as before. The left column listed the relevant parts from the interview that related to the codes identified in step #2. The codes were placed in the middle column. The third column, at the right side of the table was labelled "subthemes". Subthemes are not as deep nor subject to the same degree of abstraction as themes.

Step #4 in the analysis process took all the subthemes and codes that were identified in step #3 and organized information about them in a table (Appendix J). The table created for this step had three columns, one for the subthemes, one for the codes, and one for the total number of times a given subtheme was noted. Sometimes the participants answered a couple different interview questions with the same response. If a single response answered more than one question, it was counted as a response for each question that was answered. If a response for a single question included more than one idea, each idea was considered and counted separately in the analysis for that question. At the bottom of the table, the total number of responses was indicated. If there were missing responses, the reason was indicated whenever possible.

Step #5 in the analysis process was the creation of a document for each question, summarizing the information into themes (Appendix K). Themes are the most abstract and subject to interpretation by the researcher (Vaismoradi, et al., 2016). Themes were used to organize ideas that are connected, similar, or seem to say the same thing. Themes help make sense of what the participants said. Themes also help answer the research questions. The themes

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were labelled with a description of what each was about, and to help understand how it answered the question of acceptability. The subthemes and themes were listed with bulleted points underneath. It was also indicated how often they appeared. At the bottom of the document were quotes that illustrated the summarized themes.

Step #6 in the analysis of the data produced the report and provided a meaningful way to interpret the themes and answer the research questions.

Reflection on delivering the interview questions. The interview questions explored how acceptable the participants felt the texts were, and how adherent participants were with reading them. The interviews were structured with specific questions asked of all participants, and the questions were asked in the same order. However, the conversation often took an unexpected turn and included ideas that did not come up with all participants. The interviews were recorded with a tape recorder and transcribed verbatim by the researcher. The same list of interview questions was used for all participants and followed a consistent sequence (Appendix M). In the beginning of the interview, questions were more general (i.e., about the texts as a whole, whereas later in the interview the questions became more specific to ask about the breastfeeding texts specifically.

Evaluating the responses. At the beginning of the interviews, the participants were encouraged to do the talking. It was explained that there were no right or wrong answers, that every person's experience and opinions are important, and that a wide range of opinions is important. For these reasons, each participant was encouraged to share their first thoughts about the interview question. In addition, they were encouraged to expand on their response or offer additional perspectives on their experiences when appropriate. The participants were also instructed that if they did not feel comfortable answering a question they could skip the question.

As much as possible, the interview questions were designed so that they were not answered in just one word, or with a "yes" or "no" response. This meant that when the interview questions were scored, sometimes there were more responses than participants. It also meant that sometimes there were fewer responses than there were participants.

The number of responses for each interview question varied according to the question and the way it was asked. For instance, the first question asked "Overall, what did you think about the Whispers2Mom text messages?" This allowed for an open-ended response. Some questions asked for a specific type of response, such as: "What three words would you use to describe the texts?" Finally, a few questions were not meant to be single word answers, but, based upon the responses, is how these questions may have been perceived by the participants. Examples of questions that elicited these types of responses included: "Was there anything about the texts that impressed/disappointed/frustrated you?" or the last question, which asked "Would you like to continue receiving the texts?"

Step #4 of the Whispers2Mom qualitative thematic analysis process took all the subthemes and codes identified in the previous three steps and created a table based on the total number of responses (Appendix J). This was a way to identify how many times a given response was noted to see the themes that were emerging. The number of times the responses were identified as compared to the total number of responses was noted. The more often the key words came up, the more similar that response was as compared to the responses of the entire group, which ultimately established the themes.

Summary of themes. After step #4, the interview data was examined one last time in step #5. A summary of the analysis was generated (Appendix L). This process was deductive in that it took a large amount of data and made it more manageable. The result was a way to

compare and contrast and to identify similarities and differences across all the participant

responses. A final short summary at the end briefly explained the themes that were identified for

each question. Each summary included a few representative participant quotes. As much as

possible, a wide variety of quotes from different participants was used.

Summary of Chapter Three

This chapter described the phases of the study. It described the recruitment challenges

faced and the process by which a feasible mixed methods exploratory study employing

qualitative thematic analysis was designed.

CHAPTER FOUR

The purpose of this study was to examine the feasibility of a prenatal text messaging intervention by exploring the adherence and acceptability of young adult mothers. The research questions explored the feasibility and acceptability of a prenatal text messaging intervention developed for the young adult population. Specifically, the findings address the two research questions for this study, as follows:

1) What is the feasibility of the Whispers2Mom prenatal text messaging intervention as evaluated by participant self-report of adherence?

2) What is the feasibility of the Whispers2Mom prenatal text messaging intervention as evaluated by participant self-report of acceptability?

This chapter will first present the sample's demographics. Then findings from the interview data analyzed using thematic analysis (Braun & Clarke, 2006) will be presented. Coding revealed one major theme for adherence and three major themes related to acceptability. The data are organized and reported by theme along with exemplar quotations. Finally, quantitative findings will be presented to include the results of the Whispers2Mom Survey and the Infant Feeding Intentions (IFI) scale (Nommsen-Rivers & Dewey, 2009).

Demographics

The mean participant age in the sample (14) was 24 years (*SD*= 2.3, range = 19-26). When asked their ethnicity, one participant reported being Hispanic. When asked their race, 10 participants reported being Caucasian, 3 reported being African American, and 1 reported being Native American. All participants were high school graduates, and three had not attended school beyond high school. Eight participants reported some college education, and three had a graduate degree. Two participants were currently in school. When asked about relationship status, 2

participants reported being single and un-partnered, 4 were single and partnered, and 8 were married. All participants indicated that they were employed. Hours per week worked ranged from 1 to 2 hours per week to over forty hours. Six of the participants reported working full-time (40 hours per week). The mean number of hours of employment per week was 30 (range, 1.5-40 hours; *SD*= 11.0). Seven participants reported enrollment in social programs, often more than just one. Six participants were enrolled in the WIC program, and 7 were enrolled in BadgerCare, which is Wisconsin's Medicaid program. Six individuals had private insurance through their employer. One participant was enrolled in Wisconsin Works (W2). Finally, 3 participants were enrolled in the Text4Baby program prior to enrolling in the study, meaning they were receiving those texts in addition to Whispers2Mom texts.

Research Question 1: What is the Feasibility of the Whispers2Mom Prenatal Text Messaging Intervention as Evaluated by Participant Self-Report of Adherence?

The first research question addressed the feasibility of the Whispers2Mom prenatal text message program as measured by self-report of adherence, which was measured by how often the texts were read. One major theme emerged from the question that addressed his research question.

Theme A1: Prenatal adolescent and young adults were adherent in reading Whispers2Mom text messages for a period of one month. Overall, respondents (13) indicated that they consistently read the Whispers2Mom text messages every day:

> *I think sometimes I ignored them just like I ignore most texts but I never didn't read them, I still read them every day.*

One respondent stated that while she tried to read the texts every day, there were times she might wait to read them until the next day at the latest:

I don't have to do it right away, at certain times it would just have been sitting there

waiting for me in the morning.

An additional comment provided about adherence was related to convenience of receiving the

texts, namely:

I thought it was nice that you didn't have to check in on your own, you just received it

during the day so it's like whenever it's convenient to you.

Therefore, the adolescents and young adults enrolled in the Whispers2Mom study found text

messaging as an acceptable form of communication as measured by adherence for a period of

one month.

Research Question 2: What is the Feasibility of the Whispers2Mom Prenatal Text

Messaging Intervention as Evaluated by Participant Self-Report of Acceptability?

Feasibility was defined as participant self-report of acceptability. Three major themes

emerged related to the acceptability of the text messaging. Overall, the participants responded

there were several reasons that participants found the Whispers2Mom texts acceptable. The

themes cited structure (when and how the texts were sent), meaning (what the texts

communicated), and feelings (what emotions were associated with the texts). Table 5

summarizes the themes, subthemes, codes, and provides quotations for the acceptability

question. Appendix L represents the relationships between the themes, subthemes, and codes for

the acceptability question.

Theme B1: Acceptability of Whispers2Mom text messages as indicated by structure.

When participants answered interview questions, many of their responses indicated that they

considered the Whispers2Mom text message structure (or the way that they were delivered, such

as how and when the texts were sent) acceptable. For instance, when asked about the number of texts, nearly all participants ($n = 13$) indicated that they were satisfied with receiving one a day:

I actually liked having something to read every day, and

It's kinda fun to have something come every day and you're like "oh, what's happening now?" and

Every day had its own way of saying what the baby needed to say, and

I think it was just the right amount of information for how often it was sent

When asked a similar question, specifically about the breastfeeding texts and how often they were sent, participants ($n= 13$) indicated that receiving them daily was both adequate and not intrusive, stating:

I don't think it was overwhelming or anything like that, and

If people don't know about what to do about the benefits of breastfeeding, or even anything about it. I think getting it that often could be informative like oh I didn't know that or I didn't know that and so that could help.

One participant indicated that she not only didn't mind the number of texts, nor that they came every day, she actually read them more than once, stating:

It seemed like more. I guess that's because I kept re-reading them.

In particular, participants pointed out that they appreciated the timing of the texts. The texts were received between 1130 and 1200 each day. The participants explained that this time frame was considered preferable to the texts arriving at different times each day, or at other times that might interfere with family activities, such as in the evening.

The participants considered the Whispers2Mom text message program to be user-friendly, using words like "easy" and "convenient". One participant explained it this way:

I thought it was nice that you didn't have to check in on your own, you just received it during the day so it's like whenever it's convenient to you. Whereas the apps I've used, it's just like well, if you don't… go in and check the app itself, it doesn't just come to you.

Another participant summed up the positive aspects of the Whispers2Mom text message structure by simply saying:

I like the way that they were delivered.

Theme B2: Acceptability of Whispers2Mom text messages as indicated by meaning. When participants were asked interview questions about the texts, many of their responses indicated that the Whispers2Mom text message meaning (described by participants as good information provided) was acceptable. The responses included references to specific topics, the usefulness of the texts, and their effectiveness as reminders. One question in particular, asked; "overall, what did you think about the Whispers2Mom text messages?" Responses (*n*= 10) indicated that participants liked what the text message had to say, as one stated:

I just liked having the little text say "oh hi mom."

Table 5

Overview of the Main Themes, Subthemes, Codes, and Quotations: Acceptability

Main themes	Subthemes	Codes	Quotations
Theme B1. Acceptability of Whispers2Mom text messages as indicated by structure (the way that they were delivered).	When texts are sent	Timing	"They came at a regular time every day."
	How texts are sent	Convenient, Easy to receive, Easy to read	"I thought it was nice that you didn't have to check in on your own, you just received it during the day so it's like whenever it's convenient to you. Whereas the apps I've

			used, it's just like well, if you don't… go in and check the app itself, it doesn't just come to you."
	Presentation	Little phrases, Nice little messages	**"**They're short, sweet, and to-the-point, which is nice."
	Consistency	Read every day	"It was nice to get them every day."
	Every day	Just right	"I like the way that they were delivered."
Theme B2. Acceptability of Whispers2Mom text messages as indicated by meaning (good information provided).	What texts communicate	Benefit, Felt prepared, Greater awareness of breastfeeding, Learning new things	"That it wasn't just about baby's development… suggestions for mom like 'make sure…', 'ask your doctor about back problems', or 'sleep on your left side.' Things you don't always think about."
	Informative	Info provided, What you're getting into, Interesting, Insightful, Helpful	"It was not like just the obvious stuff that you are told about."
	Usefulness	Helpful hints, Helpful, Useful	"I think it was good because…you didn't realize all that the baby could do inside of you.

			People sometimes think the baby was just you know growing, but it is like they are learning a lot and you don't notice that, and so the text messages give like a good insight into what they are doing inside of you. It is like "oh, I am practicing on nursing" and you are like "oh, you are?"
	Reminders	Nice reminders, Reinforced info Reconfirming	"I was pretty knowledgeable about a lot of things, so it was re-confirming "OK, yeah, it's good that I'm choosing to do this."
Theme B3. Acceptability of Whispers2Mom text messages as indicated by feelings (the ways connections were starting with the baby).	Self-sufficiency	Prepared, Encouraging, Thoughtful	"I did think it was a good idea to encourage the moms to breastfeed like that. It's going to be there you know. Not just to rely on formula you know, for like nowadays it is all about breastfeeding…"
	Connection with baby	Connection starting, Connection with baby before birth	"… I think it's a really neat idea for the moms to have a connection with the baby. So like even though they feel like the baby inside of them, it's nice to know how like the baby is thinking you know and so… it's really nice to know you're feeling what the baby's thinking."

	Imagine the baby	The reality of baby	"They made me feel closer to her."
	Stronger bond	Felt like being a good mom, Improve bonding	"Just it was a stronger bond, when you are actually realizing that your baby really is in there, you know? And that they are talking to you."
	Baby's perspective	Relates to baby, Happy to think about	"Every day had its own way of saying what the baby needed to say."

When prompted to be more specific about their impressions of the information received in the texts, participants used terms like "interesting", "insightful", and "helpful". The participants seemed to appreciate that the texts were interesting, describing that they were different from other sources of information they had used, sharing the following statements:

It was not like just the obvious stuff that you are told about.

As far as being useful, participants indicated that the text messages provided some insight into what is happening at the baby's gestational age, beyond just growing and developing, stating:

I think it was good because…you didn't realize all that the baby could do inside of you.

People sometimes think the baby was just you know growing, but it is like they are

learning a lot and you don't notice that, and so the text messages give like a good insight

into what they are doing inside of you. It is like "oh, I am practicing on nursing" and you

are like "oh, you are?"

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Participants were then asked; "was there anything about the texts that impressed you?" Seven of the participants indicated that they were impressed by what information the texts were communicating, such as:

> *That it wasn't just about baby's development… suggestions for mom like 'make sure…', 'ask your doctor about back problems', or 'sleep on your left side.' Things you don't always think about."*

A follow-up question asked about whether the participants could offer suggestions about how to improve the texts. Five participant responses indicated satisfaction with the texts and did not offer any suggestions. Four participant responses did offer suggestions and explained that they would have liked more specific information, such as links to articles, etc. as follows:

> *Oh probably a little bit more on weight and how the baby's developing, but I understand that like you can't have a text like "oh by the way she has toes today" or the next day "she has little fingers" you know, it doesn't work like that* and
>
> *It could do… it might get… tricky because I don't know how spam works… but if you have a link, like put a link to articles, or a link to find out more. Because there are some… I know there are some limited here's some great information, click here for more…*

Two participants also offered a little more specific information about that idea, saying that it would be interesting if the texts could be personalized, with the name of the baby, or information related to the sex once that's identified:

> *…know if there'd be a way to… if there was a way down the line once you've hit twenty weeks and you found out the gender… if it's a boy you could add a name.*

The participants were also asked what they thought about the breastfeeding texts specifically, and the responses (*n*= 13) indicated they felt the texts were "convincing" and "insightful".

It's important, it really is. So this is pretty neutral, like yes it's telling you about the

benefits of them …

One participant indicated that while she felt she knew a lot about breastfeeding, the breastfeeding texts served as reminders and support for her decision to breastfeed:

I was pretty knowledgeable about a lot of things, so it was re-confirming "OK, yeah, it's

good that I'm choosing to do this."

When asked specifically "is there anything you would change about the breastfeeding texts?" one participant expressed the following:

I think some of them… I'm trying to think of… Some of them could have been elaborated

on a little more. Like I mean, breastfeeding will save you lots of money, obviously that's

self-explanatory. But you could go into detail…

Theme B3: Acceptability of Whispers2Mom text messages as indicated by feelings.
When participants discussed the Whispers2Mom text messages, their responses indicated their feelings or emotions, including the ways connections were starting with the baby, were acceptable. The participant responses were of two main types. The first type of response about feelings was related to mom, specifically feeling self-sufficient. The second type of response was related to the baby, such as making a connection with the baby, forming a stronger bond with the baby, imagining the baby, and understanding the baby's perspective.

When participants described feelings of self-sufficiency they used words like prepared, encouraging, and thoughtful. The following statements were shared in the context of learning, and feeling more prepared:

Learning new things, and

I felt it was like it was interesting it's like "oh, I'm on top of it," or "I've already learned

that," or "I've prepared for that or something" and

I do know a lot about having a baby, but there's still a lot to know. That's why I am

interested in taking classes about breastfeeding...

An example of a statement expressing self-sufficiency and encouragement related to breastfeeding is:

I did think it was a good idea to encourage the moms to breastfeed like that. It's going to

be there you know. Not just to rely on formula you know, for like nowadays it is all about

breastfeeding…

When questioned further about their feelings related to the breastfeeding texts, participants used a variety of different ways to express their feelings, as follows:

Confident would be a good word, and

I mean I am so excited! and

I've been getting the texts and so I am pro-breastfeed and they're not breastfeeding, and

I'm like "what's wrong with you?"

Participants were asked "I'm not sure you noticed, but the texts were worded as if the baby was talking to you. How did that make you feel?" Nearly half of the participants (*n*= 6) described an emotional response to the texts worded in this way. Participants described several different ways they were making a connection with the baby, forming a stronger bond with the baby, imagining the baby, and understanding the baby's perspective. Some of the comments were brief such as when most of the participants (*n* = 10) made remarks about the novelty of this format, saying:

It was cute and kind of funny, too, and

Makes sense, and

Best part.

One participant went into some detail about how she felt the format of the texts was different, but also how the texts worded that way gave her a different perspective about the baby. She further elaborated on that, explaining how the texts worded as if they were coming from the baby helped her to consider the reality of the baby inside her, before the birth. She noted that the texts helped her think of the baby as *her* baby. They helped her think that she was going to *have* a baby. And that in all that was going on with her, she needed to remember the baby, too:

> *Yeah, that was cool. That was different from any of the other… apps or anything like that. Sometimes it's hard when you're pregnant to think that oh, realistically to imagine that you're actually having a baby. A baby, it's not like it's just something inside of you, it's like a baby. It's different, you know? And then it's all real at the end, but… so I think it puts it in a good perspective like to hear it, to get used to hearing like that is your baby. You're going to have a kid. Kind of different. Yeah, like "think about me too." That's kind of how I thought about it sometimes.*

The reality of the baby also was evident in what another participant shared about her baby girl:

> *They made me feel closer to her.*

Another participant emphasized the idea of making a connection with the baby. She said:

> *I think it's a really neat idea for the moms to have a connection with the baby. So like even though they feel like the baby inside of them, it's nice to know how like the baby is thinking you know and so… it's really nice to know you're feeling what the baby's thinking.*

When the participants talked about the texts sounding as if the baby were sending them, the idea of communicating with the baby was also evident:

> *Every day had its own way of saying what the baby needed to say,* and

Just it was a stronger bond, when you are actually realizing that your baby really is in

there, you know? And that they are talking to you.

When asked about their feelings with the question "if you would recommend the texts, what

would you say about it to your family or friends," sixteen responses (some participants shared

more than one thought) included positive statements such as:

I would tell them it's really fun and to get it, and

It's kind of like a happy thing to think about throughout your day, and

It's just nice getting that little message daily of things that are either going on to you or

to the baby or what to expect.

And when the question was asked a different way, "if you would not recommend the texts, what

would you say about it to your family or friends?" participants still responded positively ($n =$

10), indicating that they would recommend the texts, using words like "helpful," "informative,"

and "it was good information." Other comments provided were:

I wouldn't say anything negative because now people more are relying on technology, so

they're not going to sit down and read their expecting moms book; they're going to at

least have a little idea of what is going on- on that day, during that particular term, or …

A further question asked about feelings in a slightly different way, and said "how did the texts

make you change how you feel about your baby?" Seven responses indicated an emotional

connection beginning with the baby, but there was variation in the nature of the connection, as

illustrated below:

It was like a stronger bond, because you were picturing 'Oh, the baby just talked to me'

kind of thing. Your future son or daughter aww… they're talking to you, and

I felt and maybe this is just me that I could start having a connection with the baby before

he's out. Just like I don't know, you know… I understand the not him remembering any of

that, but ummm… thinking about that coming from baby's perspective. Like there's a

connection starting already, and

I think sometimes it was like, like maybe I was I don't know, like some days it was like a

reminder like you don't have to go full force through your day or to pile on everything,

you know like because it's a little reminder that you are doing something big as it is

already. It's kind of a reminder slow down, take a second, and take care of yourself, and

know what's really important, and

I felt a stronger bond with (this participant used her baby's name here).

The participants' feelings about the breastfeeding texts were explored as well. Two of the

participants chose not to respond to this question. But of the twelve participants who did, seven

responded positively to the meaning of the texts, both as reminders of information already

known and as new information, stating:

I think this is good like breastfeeding texts are good like preparation or reminders- this

is what you're going to be dealing with if you, if you set your mind to it. It's a big deal

but it's also simple. We are made to do it, and

I didn't understand that the baby could practice breastfeeding inside the womb? Can

they? Inside? It was really interesting. It said, "Mom I am practicing on sucking for

nursing" I am like "What? Really?"

Quantitative Analyses

The Whispers2Mom survey questions and the Infant Feeding Intentions (IFI) scale were

administered to participants before the interviews. These instruments were part of the original

study design that was determined to not be feasible. However, these two instruments were

retained in the final study design to provide pilot data on the feasibility of administering them

within an adolescent and young adult population. As a result, the report of the survey results did

not directly link to the thematic analysis and is presented here as quantitative analysis.

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Whispers2Mom Survey Questions. The Whispers2Mom survey (Appendix I) took about five minutes for participants to complete. Responses were on a Likert-type scale, from 1 (not at all_____) to 10 (very _____). The survey responses are summarized in Table 6.

Table 6

Whispers2Mom Survey Results

Whispers2Mom Survey Question	Mean (Range) *SD*	Interpretation
1. If you had known about the Whispers2Mom texts before this study, how likely would you have been to sign up for it?	$M=$ 8.9 (1-10) $SD=$ 2.6	Participants felt that had they known about the Whispers2Mom texts prior to participating in the study, they would have been very likely to sign up for the program.
2. How much would you recommend the Whispers2Mom texts to a family member or friend?	$M=$ 9 (1-10) $SD=$ 2.4	All but two ($n=$ 12) of the participants indicated that they would very much recommend the Whispers2Mom texts to a family member or friend.
3. How difficult was it to use the Whispers2Mom text program? ("1" indicated "not at all difficult")	$M=$ 1 $SD=$ 0	All the participants found the Whispers2Mom text program not difficult to use.

	M= 8.8 (6-10)	This indicates that participants felt the
4. How informative do you think the texts were?	*SD*= 1.5	texts were very informative.
5. How helpful do you think the texts were?	*M*= 8.8 (6-10) *SD*= 1.5	This indicates that participants felt the texts were very helpful.

Infant Feeding Intentions Scale. Intention was measured using the Infant Feeding Intentions (IFI) scale (Nommsen-Rivers & Dewey, 2009). The first two items addressed intention to initiate breastfeeding and the last three items addressed intended duration of exclusive breastfeeding. Appendix B is the IFI (Nommsen-Rivers & Dewey, 2009).

Table 7

Distribution of Responses in the Infant Feeding Intentions Scale (n = 14)

Item	Very much agree No.(%)	Some what agree No.(%)	Unsure No.(%)	Some what disagree No.(%)	Very much disagree No.(%)
1. I am planning to only formula feed my baby (I will not breastfeed at all)	0 (0)	0 (0)	1 (7)	12 (8)	1 (7)
2. I am planning to at least give breastfeeding a try	13 (93)	0 (0)	1 (7)	0 (0)	0 (0)
3. When my baby is 1 month old, I will be breastfeeding without using any formula or other milk	9 (64)	2 (14)	3 (21)	0 (0)	0 (0)
4. When my baby is 3 months old, I will be breastfeeding without using any formula or other milk	9 (64)	2 (14)	3 (21)	0 (0)	0 (0)
5. When my baby is 6 months old, I will be breastfeeding without using any formula or other milk	8 (57)	2 (14)	4 (29)	0 (0)	0 (0)

Table 7 provides the distribution of participant responses to the IFI (Nommsen-Rivers &

Dewey, 2009), by numbers and percentages. Table 8 provides the individual total scores and the

interpretation of the ranges. The Whispers2Mom individual IFI total scores ranged from 8

(moderate) to 15.5 (strong). The mean individual score was 13.5 (*SD*= 2.6), indicating a strong

strength of intention to breastfeed.

Table 8

Individual IFI Scores (Nommsen-Rivers & Dewey, 2009)

Strength of Intention	Range	Number	% of responses
Very Low	0-3.5	0	0
Low	4-7.5	0	0
Moderate	8.0-11.5	3	21
Strong	12.0-15.5	11	79
Very Strong	16.0	0	0

(Individual total scores= mean of items 1+2 added to the sum of items 3+4+5).

Summary of Chapter Four

Based on the findings of this study, the Whispers2Mom text messaging intervention was

deemed to be acceptable. In addition, the participants were adherent in reading the texts every

day. This chapter's findings will be discussed in chapter five, in relation to the literature.

Implications of the findings to research, theory, nursing practice and policy will be explored.

CHAPTER FIVE

Public health promotion efforts are headed in the direction of implementing evidence-based interventions, and it is necessary to carefully evaluate them to determine efficacy (Bowen et al., 2009). According to Tickle-Degnen (2013) feasibility studies build a foundation for the subsequent planned intervention study. Intervention is defined as any program, service, policy, or product that is used to ultimately influence or cause people's conditions (social, environmental, and organizational) to change, as well as to influence or change their choices, attitudes, beliefs, and behaviors (Bowen et al., 2009).

Feasibility studies are meant to help researchers decide whether an intervention is appropriate for efficacy testing (Bowen et al., 2009). One of the primary purposes of feasibility studies according to Tickle-Degnen is to make sure the implementation is practical and that threats to the validity of study outcomes are reduced. According to Thabane et al. (2010) there are four primary purposes for feasibility studies, namely to examine the process, resources, management, and scientific basis of the planned study. Descriptive statistics, qualitative analysis, and other basic data are how most feasibility studies should be measured (Tickle-Degnen, 2013).

Cope (2015) describes a feasibility study as giving researchers a chance to assess the adequacy of study methods and procedures. The Whispers2Mom feasibility study tested this by considering the process, specifically whether recruitment strategies, like the eligibility criteria, were suitable. It was determined early in the recruitment process that while the inclusion criteria were important conceptually, the criteria were too restrictive. Several months passed with no participants recruited despite intensive recruitment in Milwaukee where the majority of Wisconsin adolescent and young adult births take place. That prompted several changes to the study, namely, amendments and then submission of a new protocol altogether. Finally, a suitable

study design and recruitment strategy was determined. This strategy necessitated the expansion of both the ages of the mothers from 18 to 19 years old to 18 to 26 years old and gestational age of the baby from 17 to 20 weeks to not greater than 34 weeks. The data collection methods were changed too, and the discussion of methods changes will take place under the section on instrumentation.

To consider what criteria and data collection methods are feasible for a future study, it is recommended that the size of the recruitment pool be explored a priori to determine the eligible numbers of the target population available for recruitment. The total number of adolescent and young adult births in a specific geographical area is one indicator, but adding a specific gestational age range during pregnancy narrowed the recruitment pool considerably. Future studies would benefit from knowing the potential recruitment pool size related to the desired demographic characteristics before starting recruitment activities.

Another purpose of conducting a feasibility study is to assess study resources (Cope, 2015). In the Whispers2Mom study this took on the form of assessing the resources needed to ensure adequate communication to remain in contact with participants to facilitate participant retention and minimize attrition, since there was a period of time between implementation of the 30-day texting intervention and the subsequent data collection (Tickle-Degnen, 2013). In the Whispers2Mom study, participants were provided with information about how to contact the investigator if questions, problems, or concerns arose. Only one participant called, and asked about whether a response was expected for those texts that were formatted as a question. There were no expectations of a response, because the texts were only designed to be one-way communication. In the future considering potential communication questions and especially challenges prior to initiating recruitment would be advisable.

The findings of this study supported the idea that the texts were a resource to mothers and that the administration of the texts was feasible. The website (Appendix N) for signing up for the texts functioned without any issues reported, and while the participants were all provided with information about how to discontinue the texts by texting "STOP", none of them chose to do so. The intervention was based on the Text4baby program, an established successful prenatal text messaging intervention. The Whispers2Mom texts were timed so that key messages were sent to be read by the mother at the time in her pregnancy when the information was most relevant. That no one ended the intervention early, along with the finding that the texts from the baby's perspective engendered feelings of attachment, suggests that the program may have served as a daily virtual support system for the mother.

Additional resources assessment included determining whether organizations, institutions, and agencies were ready, willing, and able to help with the study activities (Tickle-Degnen, 2013). It was also helpful to explore whether there is evidence that the potential sites support research (Tickle-Dignen, 2013). According to Tickle-Degnen (2013), careful assessment of resources is considered fundamental to the success of research implementation. This proved to be one of the major barriers encountered in the Whispers2Mom study and will be discussed later in this chapter. As far as the assessment of management issues in the feasibility study, the researcher was a novice, and as such was challenged by many issues that arose. There were issues with recruitment, mostly challenges related to collaboration and communication with the possible study sites. These researcher-related barriers will also be discussed later in this chapter.

A final purpose for conducting a feasibility study is to examine the scientific basis for implementing a randomized controlled trial (Tickle-Degnen, 2013). There are many things to consider when deciding if an intervention is scientifically sound and worthy of the resources that

would be needed to test the intervention. Tickle-Degnen provides many examples of questions to ask, such as whether the intervention safe in terms of the level of frequency, intensity, and duration, and whether the intervention can be standardized, yet still maintain a client-focus. Cope (2015) emphasizes the importance of research instrument assessment for adequacy and quality, and consideration of whether those instruments have established reliability and validity within the target population.

In the Whispers2Mom study, the intervention was determined to be safe and to promote this, the mechanism to be able to voluntarily discontinue participation in the intervention was put into place if any undue stress was felt or concerns arose. This situation, for instance, might arise in the case of a woman having a fetal loss while receiving the daily texts. The intervention was standardized in terms of the number of texts, but the same texts were not sent to each participant in the study, because the participants were at different stages of their pregnancies related to the gestational age. The reliability and validity of the assessments will be discussed in the section on instrumentation.

In conclusion, the use of a feasibility study to evaluate aspects of the Whispers2Mom intervention was important for determining whether a larger clinical intervention study could be conducted in such a way that threats to study internal and external validity would be minimized (Tickle-Degnen, 2013). Individual parts of the study were examined for feasibility like recruitment, intervention and research protocol (Cope, 2105; Tickle-Degnen, 2013). It was determined that while the intervention delivery was feasible, the recruitment plan would need significant adjustment to be able to capture the intended population of pregnant adolescents.

The primary purpose of this study was to examine the feasibility of Whispers2Mom, a prenatal text messaging intervention. This study was framed by a combination of the Ecological

Systems Theory (Bronfenbrenner, 1979), the Ecological Techno-Subsystem (Johnson &
Puplampu, 2008), the Developmental Model of Prenatal Attachment (Doan & Zimerman, 2003;
2008), and the Theory of Planned Behavior (Ajzen, 1991). Despite methodological challenges
and design changes within the originally proposed study, the findings from the study suggest that
the young adult participants of this study found the Whispers2Mom prenatal text messaging
program acceptable. In addition, participants were adherent to the Whispers2Mom prenatal text
messaging program for a duration of one month. The findings will be discussed in the context of
the existing literature and theory. Methodological challenges faced and limitations of the study
will be summarized, and then the findings will be placed in the context of the theoretical
frameworks this study originally proposed. Finally, the limitations and implications for practice,
science, and policy will be addressed.

Evidence of Daily Text Acceptability

Acceptability of the Whispers2Mom prenatal text message program identified three
themes that related to text message structure, meaning, and feelings associated with the
messages. Each theme will be discussed individually and within the context of the literature.

Structure Associated with the Whispers2Mom Text Messages

Overall, the participants reported positive experiences with the texts based on structure,
specifically with when and how texts were sent. Suffoletto and Muldoon (2017) discussed the
features text message interventions needed to achieve maximum effectiveness, and noted that
one important aspect of the design is timing. According to Suffoletto and Muldoon, the best time
to send text messages is most likely dependent on an individual's schedule and personal
preference; however, in the sending of texts containing general information that was not directive
or prescriptive, then timing would not be as important.

The Whispers2Mom participants explained they liked that the texts were sent at a regular (and reasonable) time each day. The program was automated to send the texts at 1100 each day. Participants did not have a choice in deciding on the time messages were sent; however when asked, each participant expressed that this time was acceptable and that other times of the day would not have necessarily been better. In fact, participants gave examples of other times that would have been unacceptable to them, such as early in the morning, or late in the evening.

Another aspect of text message interventions to consider is the dosage or frequency. Suffoletto and Muldoon (2017) explain that ideally, how often the texts are sent should match the behavior targeted by the intervention; however, there needs to be caution in determining how frequently to send texts to avoid habituation. If texts are perceived to be sent too often, there exists the risk for participants to become annoyed and the potential benefit from the intervention being reduced. Huberty et al. (2017) explored the dose and timing of text messages in a randomized controlled trial to determine the effectiveness of texts on increasing physical activity among pregnant women who were on average age 31 ($\pm$ 5.1) years old and 13 ($\pm$ 2.5) weeks pregnant at enrollment. The findings suggest that there were no increases in physical activity regardless of texting frequency or time (Huberty et al.).

Whispers2Mom participants expressed satisfaction with how the texts were sent, explaining that they liked the idea that once they were enrolled in the study, the texts just automatically came to them each day. One of the positive comments was how convenient they were to receive, and participants mentioned that the texts coming once a day was "just right". Participants also discussed how receiving daily texts meant that the baby had a chance to "say" what needed to be said at that particular time in the pregnancy. Overall, participants reported how they looked forward to getting the text messages.

Another structure-related aspect of the texts had to do with presentation. Specifically, participants liked the length of the texts, noticing that they were "short, sweet, and to-the-point". Simple was a word used to describe the ease of use of the texts. When participants were asked to describe the texts using three words, the words chosen related to the utility of the information they provided to the reader. The descriptive words used in relation to the utility of the text message program were mostly about how easy the texts were to use as quick sources of information and as reminders about information they may have already known.

Some participants noted the potential for enhancing the Whispers2Mom text messaging program by allowing for more tailored information to be provided. Specific suggestions were made to provide websites or links to articles so that additional information could be readily accessed if desired. The participants did not suggest the possibility of having direct two-way communication with the text message sender, although this may be another way to tailor information to meet specific health care needs. According to Suffoletto & Muldoon (2017), while the two-way system of text messaging may be more engaging, it is more complicated to design, operationalize, and evaluate for efficacy.

Meaning Associated with the Whispers2Mom Text Messages

The literature suggests that both adolescents and young adults experience pregnancy differently than older women- socially, physically, emotionally, and psychologically (Kingston, Heaman, Fell, & Chalmers, 2012; Tilghman & Lovette, 2008). It was important to keep this in mind while recruiting participants as this population may face perceived threats to their social, physical, emotional, and psychological well-being (Gemmill, Williams, Cooke, & Grant, 2012). Adolescents manage normative challenges with development that can complicate their ability to adjust to the mothering role (DeVito, 2010). According to Celik and Toruner (2017), adolescence

is a period of physical, psychological, emotional, and social changes, and experiencing a pregnancy during adolescence may concurrently present several negative aspects of development that can increase the risk to maternal and infant health. In addition, it may be difficult to engage adolescents in preventive health care services due to inequities among social determinants of health (poverty) combined with the idea that adolescents are generally individuals who have not yet manifested disease processes seen in older adults (Thompson, 2016). In addition, adolescents often do not expect to need health care services, they are often protective of their confidentiality and privacy, and are sensitive to being judged (Thompson, 2016). The evidence suggests that many adolescent mothers are not ready to address the challenges of parenthood and therefore need extra guidance, instruction, and support from health care educators and providers (DeVito 2010; Thompson, 2016). Text messaging may be one way to lend additional support adolescents and young adults need.

The Centers for Disease Control and Prevention (2012a), have a number of recommendations for researchers to ensure that health-related social media messages (such as texts) are actually read. The first is know your audience so that you can identify their needs and concerns to focus the information within the specific messages. The more that is known about the target audience, the better one is able to identify specific health promotion behaviors that are needed. Schilling et al. (2013) published a toolkit to aid researchers in developing effective text messaging systems. The authors recommend considering the needs and preferences of the recipient when designing a text messaging intervention noting that text messages are more effective when written using the target audience characteristics in mind, along with the program's desired outcomes. Whitaker et al. (2012) identified Text4baby topics according to guidelines established by the American College of Obstetricians and Gynecologist (ACOG) and

prioritized them according to top public health concerns. The Text4baby program developers held informal discussion groups asking women what topics they would find helpful (Whitaker, et al., 2012), which resulted in the development of Text4baby topics and texting frequency of three texts per week. Over the course of a pregnancy, the Text4baby program sends around 250 messages to pregnant women and new mothers (Wellpass, 2017a). These messages are not personalized, but do provide relevant information based upon the gestational age of the pregnancy (Wellpass, 2017b).

The Whispers2Mom text messages were based on the Text4baby program. The average age of the Text4baby participants was 27 years of age, and 44 percent reported being married (Martinez & Uekusa, 2014). Despite not being able to recruit adolescents into the study, the content of the Whispers2Mom texts were originally designed to address the breastfeeding information needs of the adolescent and young adult population. Specifically, adolescents (Giedd, 2012) and young adults expect ease and immediate access of information (Prensky, 2001). The Whispers2Mom texts were created to take advantage of the way this population adapts to their environment, learns about their world, and communicates with others. In general, adolescents and young adults have adapted to their environment by expecting information to be readily accessible, immediately available, and endless in quantity. They learn from a seemingly endless supply of information, but simply knowing where to find information, such as on the Internet, does not mean that the information is credible, reliable, or of sufficient depth to promote deep learning. According to Giedd (2012), one of the most useful skills for children and adolescents to acquire will be to evaluate the data, understand the difference between signal from noise, synthesize the content, and then apply it to solve problems. Cell phones provide

adolescents and young adults that ready access to information, whether academic, social, or otherwise.

Giedd (2012) describes the differences between the adolescent and adult brain in the following ways: adolescent behavior involves increased risk-taking; adolescents engage in increased sensation seeking; and adolescents move away from parents and towards peers. These behaviors suggest the development of independence. For these reasons, the Whispers2Mom text messages focused on safety, injury prevention, stress reduction, and warning signs. For instance, there were many texts in the Whispers2Mom program that specifically discussed the dangers of taking medications, even over-the-counter ones, and substance abuse with its negative impact on both mother and baby.

The Whispers2Mom texts messages were designed to be information that the adolescent and young adult could use, whether or not she had the support of family, significant other, or peers. In the Whispers2Mom study, the young adult participants of the final study indicated that they did share the texts with people important to them, including their mother, grandmother, sister, husband, father of the baby, and friends. It became apparent that there may be value in sending text messages to these individuals who provide support to this population. The texts could be the same information the young woman receives, or it could include texts with a specific focus on ways to lend physical, emotional, and social support as the pregnancy progresses. This would be one way that the program could be expanded to further support the adolescent and young adult.

Health care providers must consider breastfeeding as integrated and fundamental to providing prenatal care, but with adolescents it should be provided in the context of adolescent development. Thompson (2016) reports that creative ways to both communicate and educate

adolescent parents are being trialed, including texting, apps and online tools. Thompson recommends that these strategies be added to the usual care practices as long as interest, effectiveness, and accessibility support them.

Whispers2Mom breastfeeding texts were specifically discussed in the interviews. The Text4baby breastfeeding-related messages were not focused specifically on the needs of any one age group. They were developed in collaboration with several medical, public health, and breastfeeding experts to ensure that the information was accurate and that the message was one of support and encouragement (Text4baby, n.d.). Content experts from the areas of obstetric nursing, midwifery, and certified lactation services reviewed the Whispers2Mom text messages for accuracy and acceptability as well.

When considering the Text4baby program overall, the evidence from a nationwide telephone survey of a sample of participants enrolled at least one month suggests that 95 percent of the participants felt that the program provided them with information about health they did not know (Martinez & Uekusa, 2014). Text4baby participants receive knowledge-based texts on topics in four critical areas, namely safe sleep, infant feeding, the best time to give birth in a healthy pregnancy, and the meaning of full term (Wellpass, n. d.). By comparison, when considering the Whispers2Mom program overall, the texts addressed similar topics to Text4baby. Martinez & Uekusa (2014) found that Text4baby is positively impacting participant health knowledge and reminding them about things like appointments. Similarly, the Whispers2Mom participants mentioned that the texts provided both new information and known information, which served as a convenient reminder and reinforcement of known knowledge.

A Text4baby study conducted by the National Latino Research Center and University of California San Diego suggests that Text4baby increased participant knowledge, facilitated

communication with providers, improved adherence to health appointments and immunizations, and increased awareness and access to health resources (Martinez & Uekusa, 2014). In fact, 45 percent of Text4baby participants (*n*= 932) reported calling a phone number or service they received from a Text4baby message, and 76 percent (*n*= 932) reported using a link from a text (Martinez & Uekusa, 2014).

Many Whispers2Mom participants thought the information in the breastfeeding texts was good, but in some cases, were reminders about information they already knew. Others thought the breastfeeding texts made them think more about breastfeeding, and resulted in them caring even more about that topic. Overall, participants felt positively about the information found within the breastfeeding texts. While the Whispers2Mom texts did not provide phone numbers, services, or links, participants did report that the texts exposed them to new information, reinforced information they already knew, and prompted them to ask their physicians questions about topics they read in their text messages, much as the Text4baby users had reported (Martinez & Uekusa, 2014). Further exploration of these findings within a true adolescent population would lend important feasibility data to a future study.

In the Whispers2Mom study, participants frequently discussed the text messages in terms of the meaning of the information. For instance, one frequent idea that participants used related to the meaning of the texts was the word "benefit" or "beneficial". According to Suffoletto & Muldoon (2017) text message interventions should promote a balance of short-term actions and long-term behavior patterns. The first step would be to design text messages that are relatable, information that the receiver could easily understand and then apply to promote health, prevent disease, or recognize risks, etc. The Whispers2Mom participants mentioned that the texts

addressed risk identification, and shared how important they felt that was to their health and the health of their baby.

Martinez and Uekusa (2014) asked participants to rate the usefulness of Text4baby on a scale from 1 (not useful) to 5 (very useful). The participants rated the service a "5" (indicating very useful), 65 percent of the time, with an overall rating of 4.4 out of 5 (Martinez & Uekusa, 2014). When the Whispers2Mom participants were asked to describe the texts using three words, one of the themes was related to the information the text provided. The information was described as educational, insightful, interesting, and helpful. When asked if they would recommend the texts to a friend or family member, participants said they would recommend them based on content and usefulness. The rationale was based on the fact that people rely so heavily on technology today and that people are often too busy to read books. Instead, the participants felt the texts offer "at least… a little idea of what is going on- on that day, during that particular term …"

Participants found some of the information in the Whispers2Mom text messages interesting or surprising. They explained that the information was not just about topics they expected to see, like fetal development, but also unexpected mother-focused topics such as suggestions for comfort measures and self-care. Participants shared that these unexpected topics were things they did not ordinarily take time to think about. This information had the potential for long-term benefits for both the mother and by association, her baby. At the very least it provided a chance for the participant to consider that her health is important too. The variety of the texts was also discussed by participants, from helpful hints, to what to expect, to what helps get them through the day.

Feelings Associated with the Whispers2Mom Text Messages

It is estimated that 77 percent of adolescent pregnancies are unplanned (USDHHS, 2016). Pregnant adolescents often face many different economic and social challenges that can contribute to their physical and emotional health (Hodgkinson, Beers, Southammakosane, & Lewin, 2014). Adolescents often feel insecure and judged by others, especially in environments where there are groups of older people, like antenatal classes (Royal College of Midwives, 2015). Many adolescents feel as though they have little sense of control over their lives, making the transition to adulthood and parenting even more difficult (Royal College of Midwives, 2015).

Even though adolescents are historically less inclined to breastfeed (Ditmar, 2011), breastfeeding should be encouraged among adolescents because of the number of physical and emotional benefits to both mother and baby (Liu, Leung, & Yang, 2014). Adolescent mothers who breastfeed often feel a sense of accomplishment; this enhanced self-esteem may provide long-term benefits for the entire family (Ditmar, 2011). Interventions to improve rates of breastfeeding are most effective when they are delivered in a combination of settings (Sinha, et al. 2015). Education about the benefits of early childhood nutrition can play a crucial role in the health and well-being of the individual throughout life (Heinig et al., 2006).

Prenatal education is recognized as a strategy to positively impact the outcomes of adolescent mothers and their infants (Ford et al., 2002; Koniak-Griffin et al., 2000; Walker & Worrell, 2008). Adolescents tend to need more support and education during the prenatal period as compared to adults (Montgomery, 2006). Adolescent breastfeeding education must take into account their developmental and social support needs (Grassley, 2010) in order to positively influence their attitudes toward breastfeeding (Mossman et al., 2008). Grassley (2010) explored

how adolescents feel about breastfeeding and the findings suggest that they may be hesitant to ask for information.

The Text4baby program has a goal of improving health by increasing access to information and resources, and in the process, increase a mother's belief and self-efficacy to engage in healthy behaviors that will benefit both her and her baby (Remick & Kendrick, 2013). Evans, Wallace, and Snider (2012) conducted a randomized pilot evaluation study to assess the efficacy of Text4baby. The findings suggest that exposure to the Text4baby messages was associated with an improvement in women feeling that they were prepared to be new mothers (n = 48), as compared to those in the control group (n = 38), who did not receive Text4baby messages (Evans et al., 2012). The Evans et al. (2012) findings suggest a significant effect of the exposure to the Text4baby intervention on increased agreement with the statement "I am prepared to be a new mother." It is possible that the findings reflect a cumulative effect of the messages that were sent on many different topics, resulting in mothers being better prepared for pregnancy and new motherhood, and understanding the importance of actively promoting their health (Evans et al., 2012).

Despite not having adolescents in the final sample, Whispers2Mom was designed to increase information access and emotional support to pregnant adolescents and young adults by using their preferred way to communicate, namely text messages. When the Whispers2Mom participants were asked to describe the texts using three words, one of the themes that emerged was related to feeling states. The words describing the feeling states included fun, encouraging, lovely, thoughtful, useful, and exciting. A different interview question asked participants to describe how the texts made them feel. The responses varied, but almost all were positive, describing how they felt like a good mom. This reflects similar findings reported by Evans,

Wallace, and Snider (2012). Many mothers in the Whispers2Mom study described feeling a connection with the baby before birth. Participants described how reading the texts worded from the baby's perspective helped them feel the connection was already starting between them and their baby. They explained that this helped promote a feeling of self-sufficiency, including feeling prepared, with an increased awareness of breastfeeding. The Whispers2Mom participants felt that the texts were improving their pregnancy in terms of outcomes, bonding, and a sense of being prepared. Whether this finding is replicable in an adolescent population needs further study.

According to Doan and Zimerman (2008), prenatal attachment happens in four different ways: cognitive attachment, emotional attachment, attachment behaviors, and self-care practices. Cognitive attachment is having the ability to think of the fetus as a separate person; emotional attachment means having empathy for the fetus; attachment behaviors are ways in which the mother responds to and interacts with the fetus; and self-care practices refer to engaging in good health practices (Doan & Zimerman, 2003; 2008). The Whispers2Mom prenatal text messaging intervention may strengthen the potential for prenatal attachment in the adolescent and young adult by targeting the four different expressions of prenatal attachment as indicated in the Whispers2Mom theory connection table (Appendix H).

The Whispers2Mom participants liked that the texts were worded as if coming from the baby. They described that as cute, different, and when communicated in this way, provided the baby's perspective. When asked specifically about how the texts being worded from the baby made them feel, many of the participants described having an emotional reaction. The participants expressed that they could imagine the baby. According to Doan and Zimerman (2008), for prenatal attachment to occur, there are certain key attributes that need to be in place,

namely having the ability to think abstractly and mentally represent someone else. Expectant mothers fantasize about their unborn children and create mental representations about what the baby will be like (Doan & Zimerman, 2008). The evidence suggests that without the ability to create an understanding of the fetus as a separate person, the potential for prenatal attachment to occur would be low (Doan & Zimerman, 2003).

With the Whispers2Mom participants, the connection theme was evident, especially in the ways that participants mentioned the baby's "voice" and perspective. One participant described that the way the texts were worded made her feel as though she was "hanging with the baby". When another question asked how the texts made the participant change how they felt about the baby, responses were mixed with some saying there was no change. But for those who did experience a change in how they felt about their baby, they described the development of a closer bond. In addition, there was an emerging awareness of the reality of the baby, helping it all to sink in and making it all feel real to the mother. In terms of the emotional development aspect of prenatal attachment, Doan and Zimerman (2008) posit that empathy is necessary, meaning the mother can have concern for others, is able to be sensitive to others' needs, and can separate self from "other." In this way, the Whispers2Mom findings suggest that the text messages may increase psychological and emotional adaptation to the pregnancy, but again, whether this occurs in an adolescent population needs further study.

The Whispers2Mom participants were asked about how the breastfeeding texts made them feel, and the responses reflected a positive attitude towards breastfeeding in general and the texts. Some of the participants explained that the texts made them feel more confident. This confidence was related to understanding the benefits of breastfeeding. All of this helped them to become more excited about breastfeeding their baby.

Adherence to the Whispers2Mom prenatal text message program was explored with the interview questions. Inspection of the participant responses identified one theme related to text message adherence, which will be discussed below and within the context of the literature.

Participants Adhered to Reading Whispers2Mom Text Messages for One Month

Texting continues to be prevalent among cell phone users, with 97 percent of 18 to 29 year olds using their cell phone to communicate (Duggan, 2013). According to Johnson (2013), over 99 percent of text messages are opened and 90 percent of all text messages are read within 3 minutes of being received. Many studies have been designed to explore efficacy of text message interventions for several different health-related issues, such as sexually transmitted illnesses (Lunny et al., 2014), disease prevention, health promotion, smoking cessation, physical activity, weight loss or chronic disease self-management (Hall, Cole-Lewis, & Bernhardt, 2015). But limited evidence exists related to text intervention characteristics like frequency of text messaging, timing of delivery, and interactivity of text messaging (Hall et al., 2015).

While the Whispers2Mom text messaging program was patterned after Text4baby, a main difference was that in Text4baby three messages are sent each week (USDHHS, 2013) as compared to Whispers2Mom in which one message was sent each day. In the Whispers2Mom program, just as in the Text4baby program, there were a variety of topics addressed including prenatal care, labor, and birth, and breastfeeding (USDHHS, 2013). The evidence from a systematic review of text messaging as an intervention to deliver health promotion programs in pediatric and adolescent populations (mean age range = 8.7 to 17.9 years) suggests that text messages may be most effective as reminders in disease management (Militello, Kelly, &

Melnyk, 2012). It was decided to send a daily text to provide additional consistency and support that we theorized adolescents and young adults may need.

In a prospective cohort study designed to assess factors related to the enrollment process and reception of Text4baby, over 90 percent of participants reported uninterrupted reception and regular reading of messages (Gazmararian, Elon, Yang, Graham, & Parker, 2014). According to Hoff (2014), 92 percent of Text4baby participants regularly read the text messages. The specific Whispers2Mom interview question addressing adherence asked participants the frequency with which they read the texts, and all but one reported reading the texts every day. This suggests that the daily text messages were convenient to use. One participant who sometimes waited to read the texts still indicated that she read them the next day. The participant responses to this question suggest that the texts were not perceived as intrusive. That participants viewed the text messages daily suggests a positive relationship between frequency of texts and participant willingness to read them. This finding also suggests that habituation was not an issue, although the total time that the texts were sent daily was only a duration of one month. In summary, according to the information provided by participants in the interviews, participants were adherent in reading the texts every day for a month.

Methodological Challenges

There were many methodological challenges noted in the study, especially with recruitment. While the study originally sought to examine the adolescent population, over time and due to difficulties in recruitment, the age range was expanded to adolescents and young adults to age 26 years old and in the end, only young adults were successfully recruited into the study. Barriers to recruitment and issues related to instrumentation will be discussed in turn.

Recruitment

Sampling is an important part of the qualitative research design (Abrams, 2010). According to Ejiogu et al. (2010), one of the most difficult parts of conducting clinical research is recruiting and retaining study participants. Qualitative research traditions often involve reaching populations that are difficult to identify and contact either because they are underserved, vulnerable, or exist within a group narrowly defined by a set of inclusion criteria (Sadler, Lee, Lim, & Fullerton, 2010). Recruitment and retention of research participants is evolving with the increasing diversity of the American public (Dilworth-Anderson, 2011). Social, theoretical, and cultural factors may provide context for understanding barriers to participation in research among ethnic groups (Knobf et al., 2007). Theories and conceptual frameworks can help inform the researcher about the background and culture of diverse groups to address the issues and barriers that may be encountered in the recruitment process (Dilworth-Anderson, 2011).

In the Whispers2Mom study, there were several different challenges in recruitment related to the vulnerable pregnant adolescent and young adult population. Three main types of recruitment challenges were identified: participant-related barriers, organization-related barriers, and researcher-related barriers (Sullivan, 2004). These barriers will be discussed individually along with suggestions for future recruitment efforts.

Participant-Related Barriers. According to Knobf et al. (2007), establishing trust is the most important factor in research with ethnically diverse populations. Understanding the population of interest, especially for a researcher from a different ethnic group, is an important first step in establishing trust. To successfully recruit participants for a research study, the investigator must have an awareness of important characteristics such as the culture and the

geographical area from which the participants are enrolled (Wallington, et. al., 2016). Wallington et al. (2016) applied cultural competency frameworks to clinical trial research to increase minority participation. Their findings suggest that it is essential to learn about participants' cultural values, physical environments, and geographical locales when recruiting populations that are ethnically diverse.

Milwaukee County was one of the areas from which participants were recruited for the Whispers2Mom study. In 2016 the population of Milwaukee County was 951,448 and the population estimates for race are: white alone, 64.8%; Black or African American alone, 27.2%; American Indian and Alaska Native alone, 1%; Asian alone, 4.3% (Hispanics may be of any race so are included in applicable race categories) (United States Census Bureau, n. d.). In the Whispers2Mom study, many of the organizations that were contacted for recruitment of participants served members of diverse populations; however, efforts by the investigator to recruit from these organizations was not successful. In the end, the organization that recruited three individuals for the Whispers2Mom study served predominately African American mothers.

Fear and mistrust of research by minorities, especially African Americans and Native Americans, is thought to originate from a history of discrimination, oppression, and slavery that continues into the present day (Corbie-Smith, Thomas, & St. George, 2002; Knobf et al., 2006). Yancey, Ortega, and Kumanyika (2006) conducted a literature review of studies describing recruitment and retention of minority populations in health-related research. The findings suggest that participant perceptions of mistrust, especially of investigators, government, and academic institutions are main barriers to recruitment (UyBico et al., 2007; Yancey et al., 2006). There can also be a lack of trust because of past personal experiences with health care providers, including nurses (Ejiogu et al., 2011). Members of a community may collectively feel that all its members

have been treated poorly by researchers or the health care system (Ejiogu et al., 2011). The lack of medical knowledge and fear of exploitation is a barrier faced by many members of ethnically diverse populations (Ejiogu et al., 2011).Whether this was an issue that affected recruitment into the Whispers2Mom study is unknown, but is acknowledged as a possibility that should not be overlooked in future studies.

One way to address the issue of mistrust of minority participants is through investigator engagement and involvement in the community (Yancey et al., 2006). Community engagement can take different forms, such as involving people from the minority populations in aspects of the research, and working with local organizations (Yancey et al., 2006). In the Whispers2Mom study, the Director of the breastfeeding organization assisted with recruitment activities by identifying clients who met the inclusion criteria, which ultimately resulted in three participants being enrolled. In future studies, it might be beneficial to send letters of introduction to participants before any recruitment activities to explain the study and address concerns they might have (Ejiogu et al., 2011).

Community networking is an important strategy in successful research with ethnic minorities to build trust through community relations (Alvidrez & Arean, 2002; Knobf et al., 2007). A strategy for community engagement that is made of different components is recognized as both the most successful, but also is a labor intensive way to recruit minority populations due to the need for community engagement, cultural awareness, and tailored recruitment materials (Knobf et al., 2007).

In the Whispers2Mom study, the investigator attempted to establish a relationship with volunteers and clients of the breastfeeding organization in Milwaukee County. This meant trying to attend at least one meeting each month, either on a Saturday morning or a Thursday evening,

over the course of about 2 years. At the Saturday morning events, the investigator provided

snacks and supplies, and assisted the presenters in whatever ways they needed. Sometimes this

was setting up the room, greeting attendees, passing out forms, organizing the gift table, or

cleaning up. The organization had limited resources, the assistance was appreciated, and the goal

was to establish an ongoing relationship of mutual respect.

Despite these efforts to establish an ongoing relationship, participant-based barriers may

have included a lack of acceptance of the researcher. Many of the individuals approached to be

in the study were not the same race, ethnicity, or socioeconomic status as the researcher. It is

possible that there were perceived power differences between the researcher and the participants.

Power differences were explained by Dancy, Wilbur, Talashek, Bonner, and Barnes-Boyd (2004)

to be an unequal amount of authority or influence between the researcher and participants, at

many levels, including sociocultural, economic, educational, and health care. This power

differential may result in a lack of trust between researcher and potential participants. While

there was no explicit behavior to suggest that power differences existed, it is still possible that

power differentials were perceived by potential participants. Interpersonal relationships therefore

must be negotiated with an awareness of the potential for power imbalances and the need for

implementation of culturally competent research strategies (Ogilvie, Burgess-Pinto, & Caulfield,

2008).

Pregnant adolescents and young adults may not have been willing to participate in the

Whispers2Mom study for several reasons that should be considered in future research in this

population. There may have been concerns about time or economic challenges to participating in

research. There may have been a fear of being used as a "guinea pig" (Wilets, O'Rourke, &

Nassisi, 2003). As mentioned earlier, adolescent mothers are difficult to engage in preventive

health care because they are generally healthy and may not anticipate the need for health care services (Thompson, 2016). Adolescent and young adults may not appreciate the benefits of participating in research, to themselves or to society in general or participation in research may simply not be a priority in their life. In explaining the study and encouraging questions about the intervention, it was hoped that a sense of reciprocity might be fostered between the researcher and participants. In this way, both parties may feel that they were mutually benefitting from the research; however, the lack of successful recruitment suggested that a reframing of the study's intent and benefits to attend to this population in greater depth may be needed for future work.

Adolescents and young adults may also have feared loss of privacy or worried about confidentiality in the Whispers2Mom research study. They may have been concerned over people inadvertently seeing text messages that are about being pregnant, especially if they hadn't already shared that news publicly. Adolescents worry about being judged (Thompson, 2016), and may delay the news that they are pregnant to avoid facing that reality. Texts are encrypted during transfer, but may be visible on a person's screen and read by someone with access to the person's phone. In that case, it was important to discuss that the HIPAA rules and regulations about protecting patient privacy apply to text messaging in health care environments (Schilling et al., 2013). Potential Whispers2Mom participants were asked if their cell phones had password protection, and all did. They were reminded that cell phones had features like text message receipt notification which could protect their privacy, locator features, and anti-theft applications, which can help them find their phones if lost or lock their phones if stolen to protect their information (Schilling et al., 2013). One method for minimizing this barrier was to ensure that participants could un-enroll themselves from the study by texting "STOP" to a phone number provided. According to Schilling et al. (2013), text message interventions must allow participants

to either opt-in or opt-out. The researcher enrolled Whispers2Mom participants, but each person was provided information about how to opt-out themselves.

Organization-Related Barriers. The researcher began the recruitment process by determining there were a total of 2333 births to older adolescents in Wisconsin in 2015 out of a total number of 74,521 females in that age group (Wisconsin Interactive Statistics on Health, n. d.). Next the Wisconsin counties with the highest older adolescent birth rates, determined as the births per 1000 females ages 18 to 19 years old were explored (Wisconsin Interactive Statistics on Health, n. d.). The counties having the highest birth rates among older adolescents (births per 1000 females ages 18 to 19) and number of births to 18 to 19 year olds are as follows: Menominee (68.2; *n=* not reported), Adams (66.7; *n=* 13), Lincoln (64.9; *n=* 24), (Forest (59.4; *n=* 6), Washburn (55.2; *n=* 9), Marquette (53.3; *n=* 8), and Milwaukee (52.3; *n=* 670). While the birth rate is lower in Milwaukee County, the total number of adolescent births in the maternal 18 to 19 years old age range is much higher. In addition, there are numerous organizations in the Milwaukee County area that support pregnant adolescents, which is why initial recruitment efforts were focused there. Because the researcher lives and works in the Fox Valley area of northeastern Wisconsin (a distance of 60 to 90 minutes from Milwaukee County), areas within a 40 mile radius of the researcher's home were also included in the search.

Potential organizations with which to partner for the Whispers2Mom study were drawn from an Internet search of possible sites in Milwaukee County and the Fox Valley area. Examples include breastfeeding organizations, health departments, hospital systems, community health centers, Women, Infants, and Children offices, daycares, schools, and birth centers. The initial contact was by email. This may have been problematic because the email address may not have been accurate. There were times where the emails did not reach the intended recipient or

that recipient was no longer working at the organization. After about a month a second email and/or a phone call was sent. Voice messages were left at the organizations with the researcher's personal cell phone number. The initial email and phone message contained the same information describing the study and explaining that the researcher would like to discuss the details further with them, asking if there was any interest, or whether they had any suggestions for other sites to reach out to pregnant adolescents and young adults. From these efforts, only two organizations agreed to recruit participants. After no success in terms of participants being recruited within those organizations, the inclusion criteria were expanded, and eventually a feasible recruitment plan was undertaken. In the future, follow-up with organizations should occur sooner and be more intensive in nature by engaging in multiple simultaneous methods of contacting organizations.

The different types of organizations created challenges because of the wide range of interest in research participation. It is possible that there may have been more interest in participating in the Whispers2Mom study if there had been clearly defined direct or immediate benefits to the members of the organization. Stated differently, there may have been a lack of interest in participating if there were indirect or long-term benefits that were directed somewhere besides the organization. For organizations that were not experienced in conducting or participating in research, there may have been a poorly developed understanding of the research process, a lack of experience with research studies, or a concern over opportunity costs like transportation and other inconveniences.

In talking with some of the representatives of organizations, there was concern over how time-consuming and paperwork-laden the research activities might be for those involved. In conversation with potential study partners there were questions raised about the amount of time

and effort they would have to invest in the study. The message received from organizations was clear; anything considered time and resource prohibitive for themselves and the organization was not going to be possible. Similarly, a representative from one organization noted that their organization lacked the capacity to engage in work outside the organization's mission and vision.

Efforts to secure the buy-in from organizations resulted in meetings with two local university professors and a phone conversation with a midwifery faculty member. Despite expressing interest in the Whispers2Mom study, these university representatives were unable to commit to lending any support, although they suggested other organizations to try, namely WIC offices. These people were acting as gatekeepers, and researcher fatigue was apparent as the representatives described and discussed several different research projects with which they were currently involved. In general, the degree of interest in participating in recruitment activities varied greatly among the different organization. The differences were based on perceptions of opportunity costs versus benefits, variations in understanding the research process, possibly due to a lack of experience with research studies, concern over the "hassle factor", and gatekeeper/researcher fatigue. These concerns should be taken into consideration when designing a future study.

Researcher-Related Barriers. Researcher-related barriers included differences between the researcher and participants in terms of race, socioeconomic status, community of origin, engagement in the community, and distance from the recruitment sites, among other things. Despite the differences, efforts were made to engage with the communities, organizations, and participants in meaningful, culturally appropriate, and sustainable ways (Sheikh, et al., 2009). This meant not just making contact, but instead creating a relationship with gatekeepers. The lack of community membership can be a barrier to developing a shared perspective, so inviting

members of the community to participate in different aspects of the study design may be helpful. Unfortunately, while this was recognized as being instrumental to establishing support for the research process as well as providing ways to engage with diverse populations, it did not happen with most of the organizations.

Matching the ethnic background of researcher and participants makes the researcher an "insider" (Knobf et al., 2007). Having an insider on the research team provides advantages like a shared perspective, credibility, quicker access, and trust building (Knobf et al., 2007). Disadvantages include threats to validity, no guarantee the researcher is actually an insider, and a trust relationship may not actually be established (Knobf et al., 2007). In the Whispers2Mom study, it is believed that the investigator was viewed as an outsider within the organizations and agencies. In future studies, it would be beneficial for the research team to be made up of a combination of insiders and outsiders to establish trust from the beginning. This would provide information about the participants' sociocultural background that is so instrumental to successful recruitment of ethnically diverse populations.

Trust building takes time, and is ongoing (Abrams, 2010; Dilworth-Anderson, 2011). Community networking is useful in identifying supporters, stakeholders, leaders, and informants (Knobf et al., 2007), and is a way to gain entrée. Involvement in the community of interest can take many forms, such as volunteering in local events, outreach, support, etc. Not being a member of the community where recruitment activities took place made it difficult to establish trust with the members of the organizations contacted for recruitment in the Whispers2Mom study. Potential participants need to feel safe throughout the research process (Ogilvie, Burgess-Pinto, & Caulfield, 2008). These considerations should be accounted for in a future study.

Researcher attitudes can be a barrier to recruitment activities. In the Whispers2Mom study, it is possible that some unseen researcher biases in the form of stereotypes and misgivings about engaging diverse populations were present. The researcher had extensive experience as a nurse in maternal-infant health and with the adolescent and young adult patient populations. There may have also been strongly held beliefs about breastfeeding that biased the researcher and it is possible that these biases unduly influenced ways the study was explained to participants, or how their questions about the study were answered. It is possible that frustration over the lack of success with recruitment activities was outwardly apparent, given the researcher's support of breastfeeding, especially among this population.

Another barrier to recruitment was a lack of funding. This meant that any real incentive to recruit and retain sufficient numbers of participants was difficult at best, and entirely the responsibility of the researcher. Out of pocket expenses included fuel to travel between the Fox Valley and Milwaukee, refreshments at meetings, gifts to the organizations, $25 gift card to Walmart® for each participant, and a separate track phone and calling plan dedicated for use in the study. If future studies that have resource intensive recruitment strategies, the resources should be secured prior to carrying out the recruitment protocol.

In summary, there were numerous barriers to the original planned recruitment activities that necessitated revisions to the protocol. These included participant-related, organization-related, and researcher-related barriers (Sullivan, 2004). Competing priorities among the different organizations due to limited resources played a role, as did a perceived imbalance related to research burden versus benefit. Future studies should consider the possibility that these barriers may be present, and efforts will be needed to overcome them.

There are several lessons learned from the recruitment challenges faced in the Whispers2Mom study. First initial contact of key people would be best by phone or in person, as email communication was ineffective. Involving key people in target organizations who have the same ethnicity from the beginning would have helped the recruitment process go more smoothly. Frequent, clear, and consistent communication is a must. A suggestion would be asking organization representatives their preference about how to be contacted, and to schedule meeting times. Keeping a schedule and marking recruitment progress regularly reduces the possibility that recruitment is left to chance.

Once an agency is identified as being ready and willing to hear about the study, the establishment of a *relationship,* not just a contact with gatekeepers at the recruitment sites, is critical. Establishing a relationship includes learning about the organization, its history, mission, vision, and goals. This also means finding out whether the culture of the organization supports research. If there are individuals at the organization who share the same ethnicity as the population of interest, it would be beneficial to see if they might consider participating in some aspect of the research process. This effort is critical as a way for an outsider to establish support from insiders. Investigation of organizational needs is key to determine if and how the intended research fits into the organization's mission. Clearly communicating expectations from both perspectives, investigator and organization, will be necessary. Demands on the organization and participants should be discussed, in term of opportunity costs. There should be a clear and realistic understanding of resources needed to be invested in the research process, for all involved. When barriers are identified and especially when they are encountered, then strategies need to be negotiated with the best interests of all involved in mind.

<center>**Instrumentation**</center>

Participants completed two surveys as a part of the Whispers2Mom study: the Infant Feeding Intentions Scale (IFI) (Nommsen-Rivers & Dewey, 2009) and the Whsipers2Mom Survey Questions. Each of these will be discussed.

Infant Feeding Intentions Scale (IFI) (Nommsen-Rivers & Dewey, 2009)

The IFI (Nommsen-Rivers & Dewey, 2009) was administered to the mothers in this study to establish the feasibility of its use in a future study that may evaluate the Whispers2Mom program. The Flesch Reading Ease was 80.3; the Flesch Kincaid Grade Level was 5.4. The first two items addressed intention to initiate breastfeeding and the last three items addressed intended duration of exclusive breastfeeding. Cronbach's alpha was 0.9 in two separate samples used to develop the scale (Nommsen-Rivers & Dewey, 2009). This instrument took about 5 minutes to complete, which suggests that the instrument is feasible to administer in this population and therefore, could be considered a measure of efficacy for the Whispers2Mom prenatal text message program. However, there is a lack of evidence in using this instrument with the adolescent population. Despite the study participants being young adults, the Cronbach's alpha for the IFI in the Whispers2Mom study was low (0.39) suggesting a lack of internal consistency. Therefore, additional research is needed to determine whether this finding is replicable and if so, whether the instrument adequately captures the concept of breastfeeding intention in this population of young adults and also in adolescents.

Whispers2Mom Survey Questions

The Whispers2Mom Survey Questions form took participants less than five minutes to complete. The Flesch Kincaid grade level was 5.2, and the Flesch Reading Ease was 80.6. Question #2 on the instrument was similar to one of the interview questions, which asked about

recommending the Whispers2Mom prenatal text messaging program to a friend or family member. The interview question allowed for further exploration of the topic while the Whispers2Mom survey question asked for the response on a Likert-type scale. The responses the participants gave for the two questions asked in different ways were the same, so the findings suggest that there was no confusion about what was being asked. In a future study, asking questions that further explore the themes that were identified in the Whispers2Mom study would be appropriate to add.

Limitations

There were several limitations to this study some of which were discussed previously. First, the sample was small and drawn from a limited geographical area. Another limitation was that specific educational needs of the individual participants were not addressed by the intervention. There may have been some topics that were provided but needed to be reinforced, or topics that were not discussed at all, due to the standardized nature of the texts. Personalizing the texts was a suggestion given by some of the participants. Other participants suggested adding in links to research articles or websites for further information. Text4baby provides information in the messages themselves as well as in links and other websites that are provided at the end of the messages if further information is needed or desired (Wellpass, 2017c). Future Whispers2Mom studies should examine the feasibility of making the text messages more patient-centered.

While involvement with the Text4baby program was identified in the demographic data form, it was not clear what effect other technology or programs may have had on the adolescent and young adult mother. It was beyond the purpose of this study to isolate this text message program from other technological influences there may have been. According to Skinner,

Biscope, Poland and Goldberg (2003), adolescents use technology in four main ways: personal communication (telephone, cell phone, and pager), social communication (email, instant messaging, chat rooms, and bulletin boards), interactive environments (websites, search engines, and computers), and one-way sources of information (televisions, radio, and print). Westerman (2006) describes adolescents as a group used to immediate gratification, with cell phones for communication, the Internet for information, video games for recreation, and Facebook for socializing). The Pew Research Center Internet and Technology report (Anderson & Rainie, 2012) noted that said communication and knowledge acquisition are increasingly mediated by technology. Further research studies may need to therefore consider exploring in detail the effects that different forms of technology have alone or in combination with text message interventions.

Interviewing participants provides an opportunity for them to share detailed and in-depth information, but there may be drawbacks as well. For instance, participants may not have had the ability to recall details about the text messages accurately. It may be beneficial for future prenatal text messaging researchers to ask participants to track their perceptions about the texts in a log. Wagner and Waldron (2001) explored the use of logs with adolescents having substance abuse problems as a way to help them understand what needs to change and how to begin doing that. Schilder (2002) used thought logs with adolescent participants to identify automatic thoughts, identify how accurate they were, and alter them to be more congruent with the actual situation. These strategies may increase the accuracy of data collection. Similarly, social desirability bias may be present when using self-report (Kaushal, 2014). There may also have been some researcher bias from prior personal and professional experiences with breastfeeding.

In addition, the intervention was created by students. This may have had an influence on how descriptive words were used, interview events were described, or analyses were made. Further studies with researchers who do not have a connection to the topic or intervention may address the research problem without the same potential for bias.

When this study was initially proposed, there was a lack of prior research studies on the topic of using prenatal text messages as an intervention in the adolescent population. This is important because while it may inform nursing science about the feasibility of using a prenatal text messaging program to address the prenatal educational needs, it may be difficult to draw conclusions about the adolescent population. There was also a lack of prior research studies on using the Ecological Techno-Subsystem (Johnson & Puplampu, 2008) in the adolescent population, too. As a result, it may be difficult to support the use of the Ecological Techno-Subsystem as a framework for this study.

<h2 style="text-align:center">Theoretical Perspectives</h2>

The study was informed by the Ecological Systems Theory (Bronfenbrenner, 1979), the Ecological Techno-Subsystem (Johnson & Puplampu, 2008), the Developmental Model of Prenatal Attachment (Doan & Zimerman, 2003; 2008). Together these theories provided a useful framework for exploring the feasibility of the Whispers2Mom prenatal text messaging intervention. Although we weren't able to collect data specifically on the adolescent population, application of the theories to this population is recommended for the future.

Ecological Systems Theory and the Ecological Techno-Subsystem

Bronfenbrenner's (1979) Ecological Systems Theory and Johnson and Puplampu's (2008) Ecological Techno-Subsystem informed this study by considering the impact of the immediate environment, including technology, on the young adult's microsystem (Table 2). This

included the influence of cell phones, especially text messaging. It was beneficial to understand that the microsystem has the largest impact, because that is where the individual spends the most time and has the most interpersonal interactions. Therefore, these important influences within the microsystem were used to inform and support the young adult about prenatal topics. Bronfenbrenner's (1979) Ecological Systems Theory and Johnson and Puplampu's (2008) Ecological Techno-Subsystem also informed the Whispers2Mom intervention, because the roles, norms, and rules that influence how young adults grow and change were taken into consideration within the context of their environment when creating the text messages.

Some of the interview questions were about the impact of the texts on the young adult's immediate environment, or microsystem. These questions addressed the question of acceptability, such as "overall, what did you think about the Whispers2Mom text messages?" Other interview questions asked, "if you would recommend/not recommend the texts, what would you say about it to your family and friends?" The Whispers2Mom questions also asked, "how likely would you be to recommend the Whisper2Mom texts to a family member or friend?" Considering that the infant is a part of the immediate environment, or microsystem, participants were also asked "… the texts were worded as if the baby was talking to you. How did that make you feel?" and "how did these texts make you change how you feel about your baby?" These are just a sample of the questions used to determine acceptability while considering the impact of the young adult's immediate environment. A future study that could successfully recruit adolescents would be needed to further evaluate the usefulness of Bronfenbrenner's (1979) Ecological Systems Theory and Johnson and Puplampu's (2008) Ecological Techno-Subsystem in an adolescent population.

Theory of Planned Behavior

Text4baby is a program that aims to positively impact maternal expectations about health outcomes and to promote self-efficacy, especially in the areas of resources utilization and health care decision making (Evans, Wallace, & Snider, 2012). The Theory of Planned Behavior (Ajzen, 1991) informs the Text4baby study by seeking to build self-efficacy to increase expectations of positive health outcomes related to pregnancy and new motherhood (Evans et al., 2012). Text4baby texts were created to positively influence the attitudes, beliefs, and health promotion activities of pregnant women. The text messages targeted certain attitudes and beliefs, positively influencing them, leading to health promoting actions (Evans et al., 2012). The Evans et al. findings suggest that Text4baby participants were three times more likely to believe that they were prepared to be new mothers as compared to the no-text exposure group.

The Whispers2Mom study was designed using the Theory of Planned Behavior (Ajzen, 1991) to help young adults build self-efficacy by gaining health knowledge and understanding health risks. The Whispers2Mom intervention of prenatal texts provided young adults with education and support related to select topics including breastfeeding, as a means of positively impacting their self-efficacy beliefs. These beliefs may ultimately influence their decisions related to breastfeeding, such as whether to breastfeed, which breastfeeding behaviors are beneficial, how to engage in those behaviors, and how much effort is needed for the behaviors.

Text4baby message content was chosen through a collaborative effort between pregnant and new mothers, the Centers for Disease Control and Prevention, and the Healthy Mothers, Healthy Babies Coalition (HMHB) (Wellpass, 2017). The HMHB conducted a review of the literature and major medical guidelines to identify priority topics and content for the Text4baby texts (Wellpass, 2017). The information provided by Whispers2Mom texts related to general

prenatal information as well as breastfeeding was chosen because it was relevant, appropriate, and useful to the stage of pregnancy. The Whispers2Mom texts were reviewed by content experts for appropriateness and accuracy.

Using the Theory of Planned Behavior (Ajzen, 1991), a young adult's control over their health, such as the intention to breastfeed their infant, may be understood as being related to having both the opportunity and resources to engage in the behavior. In general, if a young adult intends to perform the behavior, and has the opportunity and resources to do so, they should be successful at engaging in breastfeeding. In this way, this study's findings suggest that the Whispers2Mom intervention positively impacted the young adult's perceived behavioral control through suggestions of practical strategies for successful breastfeeding. A future study that could successfully recruit adolescents would be needed to further evaluate the usefulness of these theories in an adolescent population.

Developmental Model of Prenatal Attachment

During pregnancy there may be wide variation in the skills and strategies needed for prenatal attachment, and therefore the potential for prenatal attachment will vary as well (Doan & Zimerman, 2008). The different levels of potential for prenatal attachment may be expressed as either the ability to conceptualize or fantasize about being pregnant, or about being attached to an imagined fetus (Doan & Zimerman, 2008). Prenatal attachment expressions are described by Doan and Zimerman (2008) in terms of cognitive attachment (the ability to think of the fetus as a person separate from themselves), emotional attachment (an affectionate bond with the fetus), attachment behaviors (responding and interacting with the fetus), and self-care practices (maintaining good health practices). Each of the Whispers2Mom texts have one or more of these four different expressions of prenatal attachment assigned to them.

In the Whispers2Mom study, interview question that asked, "… the texts were worded as if the baby was talking to you. How did that make you feel?" When this question was posed to the participants, no one asked for an explanation of what was meant. This indicated that the participants were able to think abstractly, with the ability to conceptualize the infant as a separate person. This is a demonstrated skill which is considered a necessary component of prenatal attachment. The emotional responses reported by participants suggest that the texts may have promoted the development of attachment to the fetus and promoted the internalization of the mothering role within the participants. The Developmental Model of Prenatal Attachment (Doan & Zimerman, 2008) would need to be further explored in a future study with adolescents in order to determine its usefulness in that population.

Implications

Nursing practice

The findings from the study suggest that young adult women were adherent to the Whispers2Mom prenatal text messaging program for one month. In addition, participants found the Whispers2Mom prenatal text messaging program acceptable. Therefore, nurses may consider using Whispers2Mom text messages along with usual care practices to educate and support their prenatal patients about topics of interest, including infant care and breastfeeding.

Whispers2Mom may be a practical and efficient way to address adolescents and young adults' needs for health information by using the currently preferred means of communication. Future studies should explore a focus on health behavior change (using different behavioral outcomes) or incorporate text message-based education as an adjunct to other evidence-based health promotion strategies. Implications to nursing practice may need further evaluation that includes research involving adolescents.

The Whispers2Mom prenatal text messaging program was developed as a service-learning project by senior nursing students to address the needs of the adolescent and young adult populations. Future service-learning projects may benefit from engaging in similar activities using mHealth interventions, with possibilities that include creating text messages for promotion of health and wellness, for managing chronic conditions, or with a focus on different populations.

Nursing Science

This study supported the underlying belief that research provides the most reliable information about a prenatal educational strategy or intervention that can positively influence health outcomes. Using the findings to align evidence about prenatal text messaging with current professional practice may be a means for facilitating quality in patient care. This study extends the understanding of the role of text messaging in adolescent and young adult prenatal patient education. The findings suggest that prenatal text messaging can be a feasible adjunct to usual care practices in adolescents and young adults. The Ecological Systems Theory (Bronfenbrenner, 1979), the Ecological Techno-Subsystem (Johnson & Puplampu, 2008), the Developmental Model of Prenatal Attachment (Doan & Zimerman, 2003; 2008) and the Theory of Planned Behavior (Ajzen, 1991) were a useful framework for this study. The theories, when taken together, may also help guide researchers to develop and evaluate further interventions and strategies in order to achieve desired health outcomes in young adults. Further evaluation with research that is inclusive of the adolescent population would inform the science of nursing.

Nursing Policy

Whispers2Mom may be useful to help achieve Healthy People 2020 goals such as MICH-10, which is to increase the proportion of pregnant women who receive early and adequate

prenatal care, when used in combination with usual care practices (USDHHS, 2017). Nursing interventions using text message technology may be able to reach prenatal patients in underserved areas to increase numbers of mothers who engage in positive pregnancy behaviors like breastfeeding. Prenatal text messages may be used as an educational outreach for adolescents, young adults, and populations who may be less likely to receive adequate prenatal care or attend prenatal classes. National and local health care policies may be created that can influence the allocation of funds for health care interventions like Whispers2Mom to address the needs of underserved populations, such as individuals living in rural areas.

Conclusions

Based on the study's findings, the following conclusions are offered:

1. Participants were adherent in using the Whispers2Mom prenatal text message program for a period of one month.

2. Participants found the Whispers2Mom prenatal text message program acceptable.

3. The Whispers2Mom prenatal text message intervention is feasible, as measured by self-report of adherence and acceptability.

Recommendations

Future research should focus on specific breastfeeding behaviors as well as desired outcomes in order to provide practical and applicable evidence. Exploration of enhanced text messages (containing links and websites, etc.) may be needed to increase the levels of breastfeeding intention and initiation in adolescent and emerging adult women. Text message tailoring through personalization and feedback could be explored, as personalized messages containing information specific to the recipient, such as a name, may be an attention-getter and motivator. More rigorous study designs with larger and more representative sample sizes

including different age groups, settings, and locations would be beneficial. It would also be

beneficial to obtain information about text message intervention factors such as dose (how often

the texts are sent), duration (how long the text messages are), and other aspects of text messages

(insertion of websites and other links).

Important features related to text message design is one and two-way communication.

Most texting programs that have been studied are the simpler one-way designs in which content

is sent and no patient response is allowed (Suffoletto & Muldoon, 2017). More research is

needed with both types of text messaging to see which form of text message design provides the

most efficacious results. Other research opportunities may also exist to explore text message

interventions with not only different populations, but different topics as well, broadening out

beyond breastfeeding to overall perinatal health. In addition, while short-term effects of text

message interventions could not be objectively assessed in this study, the findings suggest the

need exists for further exploration of potential long-term effects of technology-related

educational interventions as well.

The Whispers2Mom program may be expanded to include texts designed for the partners

or support persons of the mothers. Texts may also be designed to educate and support the mother

in the postpartum period, with text messages that focus on promoting breastfeeding as well as

infant and self- care. Finally, texts may be translated into languages for use by non-English

speaking groups. Text messaging used as an interventional tool may help promote collaboration

between patients and health care providers.

Given the positive preliminary results in this study, and the fact that technology is a

common and important part of the life of adolescents and emerging adults, text messaging may

be an efficacious addition to usual practices and interventions that already exist for health promotion and disease prevention during the perinatal period.

Summary of Chapter Five

This chapter included a discussion and interpretation of the findings from both interviews and instruments. The daily text acceptability was discussed first, followed by a discussion of the daily text message adherence. Methodological issues and limitations of the study were presented. Theoretical perspectives were revisited. Implications for nursing practice, science, and policy were offered. Finally, the conclusion and recommendations were provided.

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APPENDIX A

Permission granted from the Canadian Journal of Learning and Technology (Ms.Jenna Kelland, Managing Editor) for the Ecological Techno-Subsystem Model (Johnson & Puplampu, 2008) Communicated by Email 5/18/14

"Hello Chris,

I see you have already contacted the author to get approval to use the material, which I'm sure she appreciates.

Under the Creative Commons License you can reproduce this figure from CJLT/RCAT. Thank you for letting us know you will be using this material in your research.

Jenna Kelland
Managing Editor
CJLT/RCAT"

APPENDIX B

Infant Feeding Intentions Scale (Nommsen-Rivers & Dewey, 2009)

Instructions read to subject: I am going to read to you some statements about feeding your baby. Please choose the answer that most closely matches your opinion, considering both your feeding plans and the likelihood that you will carry out those plans.

	Very much Agree	Somewhat Agree	Unsure	Somewhat Disagree	Very much Disagree
1. I am going to only formula feed my baby (I will not breastfeed at all)	0	1	2	3	4
2. I am planning to at least give breastfeeding a try	4	3	2	1	0
3. When my baby is 1 month old, I will be breastfeeding without using any formula or other milk	4	3	2	1	0
4. When my baby is 3 months old, I will be breastfeeding without using any formula or other milk	4	3	2	1	0
5. When my baby is 6 months old, I will be breastfeeding without using any formula or other milk	4	3	2	1	0

Numbers within grid represent the point value for each response. Total score= (mean of items 1+2) + (sum of items 3, 4, 5). Thus, total score ranges from 0 (very strong intention to not breastfeed at all) to 16 (very strong intention to breastfeed exclusively throughout the first 6 months).

(Nommsen-Rivers & Dewey, 2009)

APPENDIX C

Demographic Data Form

Whispers2Mom Participant Information

Please answer these questions:

1. **Are you: Hispanic yes/no**
   ____Yes
   ____No

2. **What is your race?**
   ____African-American
   ____Asian
   ____Caucasian
   ____Native American
   ____Mixed race
   ____Other _____

3. **What is your age?**
   _____ years

4. **What is your last grade** finished**?**
   For example: 11 = 11th grade
   _____

5. **What is your relationship status?**
   ____Single, no partner
   ____Single, with partner
   ____Married
   ____Divorced
   ____Separated

6. **Are you employed?**
   ____Yes
   ____No

7. **If employed, how many hours per week?**
   _____hours

8. **Are you a student?**
   ____Yes
   ____No

9. **Are you enrolled in any of these programs?**
   (pick all that apply)
   ____Private insurance
   ____WIC
   ____BadgerCare
   ____Social Security Income (SSI)
   ____Wisconsin Works (W-2)
   ____Home visitation program (like PNCC)
   ____Text4Baby
   ____Other _____

APPENDIX D

New Study Acceptance Letter: Phase One

UNIVERSITY of WISCONSIN
UWMILWAUKEE

Department of University Safety & Assurances

Melissa Spadanuda
IRB Manager
Institutional Review Board
Engelmann 270
P. O. Box 413
Milwaukee, WI 53201-0413
(414) 229-3173 *phone*
(414) 229-6729 *fax*

http://www.irb.uwm.edu
spadanud@uwm.edu

New Study - Notice of IRB Expedited Approval

Date: December 14, 2015

To: Karen Morin, PhD
Dept: Nursing

Cc: Christine Laurent

IRB#: 16.164
Title: Whispers2Mom: An adolescent prenatal text messaging intervention

After review of your research protocol by the University of Wisconsin – Milwaukee Institutional Review Board, your protocol has been approved as minimal risk Expedited under Category 7 as governed by 45 CFR 46.110. Your protocol has been granted approval to waive documentation of informed consent as governed by 45 CFR 46.117 (c), if the subject selects this option.

This protocol has been approved on **December 14, 2015** for one year. IRB approval will expire on **December 13, 2016**. If you plan to continue any research related activities (e.g., enrollment of subjects, study interventions, data analysis, etc.) past the date of IRB expiration, a continuation for IRB approval must be filed by the submission deadline. If the study is closed or completed before the IRB expiration date, please notify the IRB by completing and submitting the Continuing Review form found in IRBManager.

Any proposed changes to the protocol must be reviewed by the IRB before implementation, unless the change is specifically necessary to eliminate apparent immediate hazards to the subjects. It is the principal investigator's responsibility to adhere to the policies and guidelines set forth by the UWM IRB, maintain proper documentation of study records and promptly report to the IRB any adverse events which require reporting. The principal investigator is also responsible for ensuring that all study staff receive appropriate training in the ethical guidelines of conducting human subjects research.

As Principal Investigator, it is your responsibility to adhere to UWM and UW System Policies, and any applicable state and federal laws governing activities which are independent of IRB review/approval (e.g., FERPA, Radiation Safety, UWM Data Security, UW System policy on Prizes, Awards and Gifts, state gambling laws, etc.). When conducting research at institutions outside of UWM, be sure to obtain permission and/or approval as required by their policies.

Contact the IRB office if you have any further questions. Thank you for your cooperation and best wishes for a successful project.

Respectfully,

Melissa C Spadanuda

Melissa C. Spadanuda
IRB Manager

APPENDIX E

Feasible Study Approval Letter

UNIVERSITY of WISCONSIN
UWMILWAUKEE

Department of University Safety & Assurances

Melissa Spadanuda
IRB Manager
Institutional Review Board
Engelmann 270
P. O. Box 413
Milwaukee, WI 53201-0413
(414) 229-3173 *phone*
(414) 229-6729 *fax*

http://www.irb.uwm.edu
spadanud@uwm.edu

New Study - Notice of IRB Expedited Approval

Date: July 22, 2016

To: Jennifer Doering, PhD
Dept: Nursing

CC: Christine Laurent

IRB#: 16.378
Title: Whispers2Mom: A research study

After review of your research protocol by the University of Wisconsin – Milwaukee Institutional Review Board, your protocol has been approved as minimal risk Expedited under Category 6 and 7 as governed by 45 CFR 46.110.

In addition, your protocol has been granted **Level 3** confidentiality for Payments to Research Subjects per UWM Accounting Services Procedure: 2.4.6.

This protocol has been approved on **July 22, 2016** for one year. IRB approval will expire on **July 21, 2017**. If you plan to continue any research related activities (e.g., enrollment of subjects, study interventions, data analysis, etc.) past the date of IRB expiration, a continuation for IRB approval must be filed by the submission deadline. If the study is closed or completed before the IRB expiration date, please notify the IRB by completing and submitting the Continuing Review form found in IRBManager.

Any proposed changes to the protocol must be reviewed by the IRB before implementation, unless the change is specifically necessary to eliminate apparent immediate hazards to the subjects. It is the principal investigator's responsibility to adhere to the policies and guidelines set forth by the UWM IRB, maintain proper documentation of study records and promptly report to the IRB any adverse events which require reporting. The principal investigator is also responsible for ensuring that all study staff receive appropriate training in the ethical guidelines of conducting human subjects research.

As Principal Investigator, it is your responsibility to adhere to UWM and UW System Policies, and any applicable state and federal laws governing activities which are independent of IRB review/approval (e.g., FERPA, Radiation Safety, UWM Data Security, UW System policy on Prizes, Awards and Gifts, state gambling laws, etc.). When conducting research at institutions outside of UWM, be sure to obtain permission and/or approval as required by their policies.

Contact the IRB office if you have any further questions. Thank you for your cooperation and best wishes for a successful project.

Respectfully,

Melissa C Spadanuda

Melissa C. Spadanuda
IRB Manager

APPENDIX F

Questions to Evaluate Content Validity

Question #1	(1) Not Relevant	(2) Somewhat Relevant	(3) Quite Relevant	(4) Very Relevant

Do you find the
text messages,
on average, to be
relevant to the
adolescent?

Question #2	(1) Not Clear	(2) Somewhat Clear	(3) Quite Clear	(4) Very Clear

Do you find the
test messages,
on average, to be
clear?

Question #3	(1) Not Accurate	(2) Somewhat Accurate	(3) Quite Accurate	(4) Very Accurate

 Do you find the
text messages,
on average, to be
accurate?

APPENDIX G

Whispers2Mom Prenatal Text Messaging Intervention Schedule

Intervention Schedule

Gestational age at enrollment: 17-20 weeks

<mark>**Breastfeeding text messages highlighted (2 times/week)**</mark>

# week	Date	Gestational age	Text message content
Week 1		**17 weeks**	
Text 1	"		**Hi Mom, when you're pregnant it's very important for both of us that you find ways to relieve stress.**
Text 2	"		<mark>**Breastfeeding me will help prevent me from getting illnesses Mom. Examples are allergies, asthma, fewer cavities, less obesity, diabetes, and heart disease!**</mark>
Text 3	"		**Keep a regular sleep schedule Mom, even on weekends to prevent feelings of fatigue.**
Text 4	"		**Mom, at the Dr., be sure to mention any signs or symptoms that concern you, even if they seem silly. Talking with the Dr. will put your mind at ease.**
Text 5	"		<mark>**Hi Mom! Right after I am born I will be awake and alert for about ½ hour. This is the best time to start breastfeeding me because I will be happy to try!!**</mark>
Text 6	"		**Pregnancy increases the amount of blood in your body Mom. This may cause your nose and airway to swell because there is more blood. You may feel stuffy.**
Text 7	"		**Be sure to drink enough fluids Mom. Carry a bottle of water with you everywhere.**
Week 2		**18 weeks**	
Text 1	"		**Hi Mom, your uterus may now be felt about 1 inch below your bellybutton & I am about 5 inches long.**
Text 2	"		<mark>**Hi Mom, one great thing about breast milk is that it's always the right temperature!**</mark>

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Text 3	"		Mom, I may throw your sense of balance off, because your center of gravity moves forward with me in your uterus. Sorry about that!
Text 4	"		Please keep exercising Mom. I am swimming in here and you should swim 2! Walking is great but you may need to slow your pace.
Text 5	"		One more great thing about breast milk is that my poops won't smell as bad!
Text 6	"		Urinary-tract infections can be frequent in pregnancy Mom, help avoid them by emptying your bladder often and drinking many fluids. B sure 2 wipe front 2 back 2.
Text 7	"		I just love being rocked 2 sleep by your movements. This is why you may not feel me move when U R active.
Week 3		19 weeks	
Text 1	"		Low blood pressure or changes in blood sugar may cause U 2 feel dizzy Mom. Make sure we're getting enough fluids & you're eating properly.
Text 2	"		Mom, my favorite thing about breastfeeding is that it gives me everything I need!
Text 3	"		Mom, don't assume it's safe 2 take allergy medications. Ask your Dr. about any medicine U take in order keep us both healthy.
Text 4	"		Mom, research shows that eating frequent, small meals during the day may provide better nutrition for growing babies, like me.
Text 5	"		Mom, please call the doctor if U experience: vaginal bleeding, severe swelling of face or fingers, severe abdominal pain, or loss of fluid from the vagina.
Text 6	"		Mom, U need more calcium during pregnancy & breastfeeding & can get it from prenatal vitamins & foods like cheese, custard, pudding, milk, &yogurt.
Text 7	"		Fish can B a healthy food choice during pregnancy, but don't eat shark, swordfish or tuna (fresh or frozen) more than once a week.
Week 4		20 weeks	

Text 1	"		An ultrasound done at this point in pregnancy may make it possible 2 determine my gender, but I must cooperate! Remember there can B human error 2.
Text 2	"		Mom, did U know that breast milk is much easier 2 digest than formula?
Text 3	"		Avoid the use of artificial sweeteners or food additives (Nutrasweet, Equal, Splenda) Mom. Eliminate any substance we don't really need from foods & beverages.
Text 4	"		Hi Mom! U may hear my heartbeat with a stethoscope at 20 weeks. Usually my heart beats 120-160 beats every minute.
Text 5	"		Do Kegel exercises! Vaginal muscles will B able 2 stretch & contract better during & after delivery. The area will tighten faster after delivery.
Text 6	"		Mom, it's time 2 think about whether U will breast or bottle feed me. Breastfeeding benefits U in many ways, but it benefits me the most!
Text 7	"		We R half way there Mom! Can U believe it? Soon we will meet face 2 face. I know I don't make U feel the best, but I sure am grateful 4 U!
Week 5		**21 weeks**	
Text 1	"		The best time 2 learn about breastfeeding me is while U R pregnant so let's take a class at the local hospital OK Mom?
Text 2	"		U may notice swelling in your lower legs & feet Mom, especially after a long day. If U can, get off your feet & rest as much as possible.
Text 3	"		Mom, blood clots R more common during pregnancy. B aware if leg swelling is accompanied by pain, redness or warmth. If these symptoms arise, call your Dr.
Text 4	"		Your uterus is enlarging Mom. This stretches your ligaments & may feel a little painful. I may have given you an outie belly button 2!
Text 5	"		It is normal and healthy 4 U 2 gain more weight in the 2nd trimester Mom than in the early months of pregnancy.

Text 6	"		Mom, let's discuss with your health care provider a potential birthing plan, so U can share your hopes 4 our birthing experience!
Text 7	"		==Mom, don't use drugs or alcohol while pregnant or breastfeeding me; drugs can get in the milk and hurt me. Ask the Dr. about any medications U want 2 take.==
Week 6		**22 weeks**	
Text 1	"		Mom, continue 2 drink extra fluids 2 help keep up with the increase in our blood volume, process nutrients, and develop new cells. Urine should look clear.
Text 2	"		==Mom, if U have HIV or active TB, it is better if U don't breastfeed me. However, we can still bond through bottle feeding & cuddling!==
Text 3	"		Feeling stress is common during pregnancy Mom. Relieve stress by getting enough sleep, relax during the day, exercise, eat nutritiously, and do something 4 U.
Text 4	"		Mom, U may experience back pain, so find time 2 rest for 30 minutes on your side, watch your diet and weight gain. Back pain may B relieved with exercise: swim or do yoga. Fun!
Text 5	"		Mom, we may want 2 think about signing up 4 prenatal classes now since many classes fill up in advance.
Text 6	"		==Colostrum is the thick creamy stuff U produce first while breastfeeding. It has stuff 2 help my immune system, & it has lots of calories so I don't need as much breast milk as formula!==
Text 7	"		If U become sick during pregnancy Mom, call your doctor's office & get a plan of action. Your doctor wants 2 know whenever you're feeling ill.
Week 7		**23 weeks**	
Text 1	"		Mom, guess what? I have finger & footprints! I'm also developing taste buds & reproductive organs.
Text 2	"		I'm the size of a large mango Mom! Don't worry, I look more like a little doll.
Text 3	"		Mom, if I move a lot & keep U awake at night, I'm sorry. I'm just 2 busy figuring out my body & becoming a little person!

Text 4	"		Mom, I may B sucking my little thumb already, practicing 4 breast feeding! P.S. I will B hungry!
Text 5	"		My skin looks red right now because of the developing veins & arteries that will supply blood 2 my little body!
Text 6	"		Mom, studies say that my IQ may increase if U breastfeed me 4 at least 6 months!
Text 7	"		If U have an itchy belly, use lotion! It's itchy from me stretching your skin!
Week 8		**24 weeks**	
Text 1	"		Mom, you may see a dark line appear on your tummy called the linea nigra. It happens because of pregnancy hormones. It will fade.
Text 2	"		Mom, iron is important 4 both of us. Keep taking your prenatal vitamins and eat iron-rich foods, such as: chicken, red meat, egg yolks, and spinach.
Text 3	"		Mom, I will have a stronger immune system if U breast feed me! This includes fewer colds with a stuffy nose & fewer ear infections!
Text 4	"		Hi Mom! Remember that 2 avoid feeling dizzy when U stand up, rise slowly from sitting 2 standing, drink plenty of fluids & eat nutritious foods.
Text 5	"		Guess what Mom? I I am starting 2 grow hair on my head, eyebrows, & eyelashes!
Text 6	"		My stomach is only the size of a chick pea at birth & by 3 weeks it is the size of a walnut, not as big as some people may think!
Text 7	"		Hi mom at this time I am forming my fingerprints and footprints. Isn't that cool?
Week 9		**25 weeks**	
Text 1	"		Mom, ask your doctor if it is OK to take acetaminophen for back pain. If back pain becomes constant or more severe, talk to your doctor.
Text 2	"		Hi mom at this time I am able to blink, my eyelids open and close.

Text 3	"		**Mom, did you know that breast milk give me exactly what I need, is the right temperature and is easier for me to digest than formula!**
Text 4	"		**Hi Mom, right now my skin is red and wrinkled**
Text 5	"		**Mom, my lungs are starting to provide me with gas exchange, even though they are still immature.**
Text 6	"		**Mom, you may sweat more than you are used to. It is due to your pregnancy hormones and will return to normal after I arrive!**
Text 7	"		**Hi mom guess what- I have a hand grip! I can't wait to hold your finger.**
Week 10		**26 weeks**	
Text 1	"		**Mom, exercise can help with gestational diabetes (a form of diabetes that may develop during pregnancy).**
Text 2	"		**Mom, sleep on your left side. This gives me the most blood possible.**
Text 3	"		**Mom, we have 2 work together so U have a good supply of breast milk. The more U feed me the more milk U will make so please feed me often 2 increase the supply!**
Text 4	"		**Mom, are U experiencing heartburn? Eat small meals & drink plenty of fluids. Ask the doctor about antacids if necessary.**
Text 5	"		**Would you believe Mom that I have nails on my fingers and toes? I do! I can't wait to hold your hand**
Text 6	"		**Mom, it's not 2 early 2 start thinking about my name. There R many books available, stop by the library & pick one up.**
Text 7	"		**Mom, I am happy 2 say that breastfeeding me will save U lots of money!**
Week 11		**27 weeks**	
Text 1	"		**2 help with circulation Mom, elevate your legs, don't cross them, & wear elastic compression stockings if the Dr. advises.**

Text 2	"		Mom, my organ systems should B developed & working. Now I need time 2 mature.
Text 3	"		Breastfeeding me will give U a chance 2 relax with me- several times a day!
Text 4	"		I am sorry Mom, but you may see varying pigmentation in your skin. Avoid sun to lessen the darkening areas.
Text 5	"		I'm prone to developing "baby hiccups" this week Mom, and you might even feel them!
Text 6	"		Watch for signs of urinary tract infection, such as frequency, burning, & back & abdominal pain. UTIs can lead to kidney damage & preterm labor. If so call the Dr.
Text 7	"		Mom, the best thing for me is to have only breast milk until I am 6 months old! You can then give me lots of different fruits and vegetables!
Week 12		**28 weeks**	
Text 1	"		Having your blood pressure checked helps screen 4 preeclampsia, a serious condition if not found early. Tell Dr. about headaches & swelling in face & hands.
Text 2	"		I now have eyelashes and might be able to see light that filters in around me. I hope U think I look like U!
Text 3	"		There R benefits from breastfeeding 4 U 2 mom! Breastfeeding promotes faster weight loss & helps your uterus (my house 4 9 months) return 2 normal size!
Text 4	"		Play music 4 me Mom because I can hear now. I may even dance 4 you.
Text 5	"		Mom, U may feel a little more tired than usual. Please try to take a nap and rest when you can. It's good for both of us!
Text 6	"		Comfort is important when breastfeeding Mom, so use pillows or folded blankets 2 keep me supported during feeding.
Text 7	"		Mom, at the Dr., B sure 2 mention any signs or symptoms that concern U, even if they seem silly. Talking with the Dr. will put your mind at ease.

Week 13		29 weeks	
Text 1	"		Mom, right now I am gaining more weight (& so R U!) due 2 body muscle & fat developing.
Text 2	"		Mom, U may feel a creepy, crawly sensation in your legs. It might B restless leg syndrome, massage legs, stretch, & cut caffeine. B sure 2 talk 2 Dr.
Text 3	"		==If you breastfeed me you will probably have less bleeding, fewer urinary tract infections and less chances of becoming anemic after I arrive!==
Text 4	"		Hi Mom, can U believe that I'm starting 2 have dreams? R U having dreams about me?
Text 5	"		Mom, I'm starting 2 take up your entire uterus & may not seem as active as before. I still move a lot but won't be able to do somersaults anymore.
Text 6	"		U can prevent urinary & vaginal infections Mom by wearing loose, clean clothing. Remember 2 always wipe from front 2 back!
Text 7	"		==Mom, breastfeeding me will help U have lower risk of breast, uterine & ovarian cancers! And U will have a decreased risk of osteoporosis & breaking a hip!==
Week 14		30 weeks	
Text 1	"		Wow Mom, can U believe it's already time 2 choose a Dr for me!
Text 2	"		==Breastfeeding me can help increase your serenity, self-esteem & confidence!==
Text 3	"		Mom, it's possible that U may break out with a rash due 2 changing hormone levels. Let the Dr. know 2 B safe.
Text 4	"		It's time 2 discuss my birth plans with family & friends. We need 2 make sure everything is ready 4 me.
Text 5	"		The closer U get 2 my due date the more tired & moody U will feel. Try walking, it might help.
Text 6	"		==Hi Mom, always listen 2 what your body (& me) R telling you. If something seems wrong please call the Dr.==

Text 7	"		You may have more thin, white vaginal discharge. This may prevent harmful bacteria or yeast. Call Dr 4 vaginal bleeding or fluid leakage.
Week 15		**31 weeks**	
Text 1	"		Mom, I will make signs that I am hungry: bringing my hands 2 my mouth, turning my head looking 4 a nipple & drooling. If U see these signs, please feed me!
Text 2	"		Drink lots of water & eat more fiber in order 2 prevent constipation. No laxatives unless Dr. says so, OK Mom?
Text 3	"		If I put pressure on your lower back & it becomes painful Mom, I am sorry. Try 2 reposition yourself 2 take pressure off your back.
Text 4	"		Babies R rocked 2 sleep by their mother's movements. This is why U may not feel me move when U R active. Night night Mom!
Text 5	"		Mom U will know that I am sucking right when U see me use a slow and steady rhythm & when I swallow every 1 to 2 sucks
Text 6	"		Keep exercising Mom. Swimming can give your growing belly support & buoyancy, & B relaxing. Walking is great but U may need 2 slow your pace.
Text 7	"		The highlight of your prenatal visits may B listening 2 my heartbeat. As U listen, know that I am trying 2 tell you that I love U!
Week 16		**32 weeks**	
Text 1	"		Mom, U will notice I have sleeping cycles & they will mimic what they will B like after birth.
Text 2	"		Formula is very expensive, so if U breastfeed me you can save thousands of dollars!
Text 3	"		I may have made your abdomen very itchy due 2 stretching. Sorry Mom. Ask your nurse or doctor 4 some good lotions or creams 2 use in order 2 reduce itching.
Text 4	"		Hi Mom, discuss with your health care provider a potential birthing plan, so U can share your expectations of our birthing experience!

Text 5	"		**Breastfeeding is one of the best ways 2 bond with me!**
Text 6	"		U may feel Braxton-Hicks contractions. They R not labor, and R not really painful, but feel like tightening. Call the Dr. 2 notify 2 B on the safe side.
Text 7	"		I M absorbing important minerals such as iron and calcium! Make sure you're eating foods with them in so we both get the minerals & vitamins we need!
Week 17		**33 weeks**	
Text 1	"		**Mom, your breasts R changing 2 get ready 4 breast milk. Wear a larger bra 2 B more comfortable.**
Text 2	"		Hi Mom! How many times am I kicking? I should be kicking at least 10 times in a two hour period (that is unless I'm sleeping). If not, tell your Dr.
Text 3	"		**The thick creamy stuff you produce the first few days is colostrum. It has stuff 2 help my immune system & has lots of calories so I don't need a lot of breast milk.**
Text 4	"		Mom, do U have an "outie" belly button now when U didn't before? Don't worry; this often occurs. It should return 2 normal after I arrive.
Text 5	"		**Colostrum helps my stomach, stimulates my first bowel movement& helps 2 decrease my bilirubin (so I don't get jaundice)!**
Text 6	"		Do U know my pupils can constrict, dilate, & respond 2 light? How exciting is that? Soon you'll get 2 see them.
Text 7	"		Mom, if U haven't thought of a birthing plan 4 me yet, U should definitely start now. It is important 2 B prepared 4 my birthday!
Week 18		**34 weeks**	
Text 1	"		Your abdominal muscles R being stretched & pushed Mom, they may separate in the middle & U may see when lying down. It isn't painful and doesn't harm us.
Text 2	"		**Hi Mom, just so U know- I will nurse about 8-12 times in 24 hours for 30-40 minutes per feeding**

Text 3	"		Are U talking or singing to me Mom? I can hear you and am becoming familiar with your voice!
Text 4	"		Mom, U may B experiencing hemorrhoids. A warm bath may help soothe them.
Text 5	"		Mom, do U know that I am practicing breathing in the womb by swallowing amniotic fluid? Can U feel me hiccup?!
Text 6	"		Mom, M I making your back sore? There R massage therapists who specialize in giving massages 2 pregnant women. Let's get a massage!
Text 7	"		==You feel a tug Mom, but not pain, when I suck while breastfeeding==
Week 19		**35 weeks**	
Text 1	"		Would U believe Mom that I sleep from 20-40 minutes & about 90-95% of the day? I experience REM sleep. I'm getting 2 B such a little person!
Text 2	"		==Mom, U can expect that I will feel content when I am finished nursing==
Text 3	"		Mom, can U believe that I am coming soon?! Are you ready? I am!
Text 4	"		Mom, U may have lower back pain, pressure in your ribs, and frequent Braxton Hicks contractions. Sorry about that. I'll B here before you know it!
Text 5	"		Braxton Hicks contractions help your uterus build up strength 4 the big job ahead. Tell the Dr about any strong contractions that R regular & don't go away.
Text 6	"		==Did U know Mom that weight gain is the most important sign that I am getting enough milk?==
Text 7	"		Mom, keep up your fitness routine, with Dr's OK, especially if U sit a lot. This will help 2 boost your energy levels.
Week 20		**36 weeks**	

Text 1	"		**Mom, practicing Kegel exercises (pelvic muscle exercises) may help reduce urinary incontinence in late pregnancy and postpartum.**
Text 2	"		It's a good idea 2 B prepared Mom. Pack us up 4 the hospital now just 2 B safe.
Text 3	"		**Hey Mom! I now have a sucking reflex which is preparing me 4 feeding after birth!**
Text 4	"		Is constipation an issue Mom? Eat foods that R high in fiber like whole grain, fruits, & vegetables. Also, drink plenty of water!
Text 5	"		**Mom, I will B a hungry baby, so it may seem that I want 2 eat all the time! Please feed me when I'm hungry 4 as long as I want!**
Text 6	"		Guess what Mom? U have been giving me antibodies thru the umbilical cord which lowers my risk of infection. Thank U 4 taking such good care of me!
Text 7	"		I have a patterned sleep-wake cycle with alert periods. By now I can cry when hungry or uncomfortable. I have a strong suck reflex. R you ready 4 me Mom?
Week 21		**37 weeks**	
Text 1	"		Guess what Mom? I have reached full term! My body systems, including my lungs, R developed & I am ready 2 function outside the womb!
Text 2	"		**For the first few weeks I may not eat as often as I should so if I'm still sleeping wake me up & feed me every 4 hours 2 make sure I get enough!**
Text 3	"		Mom please contact your doctor immediately any time U experience severe headaches, blurred vision, nausea, vomiting, & severe abdominal pain.
Text 4	"		It's a good idea Mom 2 start practicing breathing movements 2 prepare 4 delivery.
Text 5	"		Just so U know Mom, U may experience more vaginal discharge as your body prepares 4 my delivery. If it's bright red, let the Dr. Know.

Text 6	"		**Mom, we will work together 2 get a breastfeeding routine down! It may take a while but remember that U have everything I need, so stay positive & relaxed!**
Text 7	"		My grasp is firm now and I turn toward the light. I can't wait 2 see U & hold your hand.
Week 22		**38 weeks**	
Text 1	"		Guess what Mom? The position I am in now is the way it will probably stay for the birth! Are you ready? Here I come!
Text 2	"		Remember: your mucous plug may B lost any time now. This is a thick, yellow and pinkish discharge. Tell the Dr. if it is watery or there is leaking of fluid.
Text 3	"		Because the time of delivery is coming soon, it is a good idea to have your delivery bag packed, as well as all other materials U will need 2 take me home.
Text 4	"		**Once my mouth opens wide, I'm ready so quickly pull me up to your breast!**
Text 5	"		Take time to feel me move. I bet it's so cool 2 feel me, but also a little weird, right? Soon U will hold me in your arms
Text 6	"		**I'm new 2 breastfeeding 2, so it may take a while for me 2 learn how 2 latch on! If the first few sucks hurt, I'm sorry, take me off & let's try again!**
Text 7	"		Having trouble breathing? Practice good posture & sleep with your body upright on pillows, ask the Dr if gentle exercise might also help.
Week 23		**39 weeks**	
Text 1	"		Hi mom my little body is storing things I need like iron, calcium, and phosphorus to help me after I am born, which will be soon!
Text 2	"		**Good news Mom! Breast milk has components that help me sleep!**
Text 3	"		My bones are fully developed Mom, but they are still soft and flexible.

Text 4	"		**Please support my back and shoulders firmly but don't push on the back of my head when you are breastfeeding me!**
Text 5	"		**Don't B alarmed if U R losing weight, this often occurs as a result of fluid loss.**
Text 6	"		**Mom U may have a surge of energy as labor gets closer & feel like "nesting." This is very normal!**
Text 7	"		**Mom, R U experiencing back pain? Use a heat/cold pack on your back, ask someone for a massage, sit in chairs w/good back support & wear comfortable shoes.**
Week 24		**40 weeks**	
Text 1	"		**Mom, let's celebrate! I am ready to meet you very soon XO**
Text 2	"		**Mom, there are different ways to hold me while breastfeeding including the football hold, cradle, cross cradle, and side lying. Please try them all so we can figure out our favorite!**
Text 3	"		**Mom, I am so excited to meet you- my skin will be smooth and pink, and I will have silky hair, and have nails over my fingertips.**
Text 4	"		**Your water may break before or during labor. If you are at home, it is important for you to get to the hospital and prepare for my birth!**
Text 5	"		**"Lightening" is how I settle down into your pelvis. This may make your center of balance off and make you have to pee more often.**
Text 6	"		**Mom, the best way to get comfortable when breastfeeding is to use a pillow to support your back & maybe a pillow to support me 2!**
Text 7	"		**I will get 2 meet you soon Mom. I can't wait! I love U! XO, your baby**

Whispers2Mom Theory Connections Table

Whispers2Mom Study
Theory Connection Table

# week	Date	Gestational age	Text message content	Ecological Systems Theory (Bronfenbrenner, 1979) Microsystem	Techno Subsystem (Johnson & Puplampu, 2008)	Prenatal Attachment Theory (Doan & Zimerman, 2008) Cognitive attachment	Emotional attachment	Attachment behaviors	Self care practices	Reasoned Action Approach (Fishbein & Ajzen, 2010) Attitudes	Perceived social norms	Perceived behavioral control
Week 1	2/2-2/8 X	17 weeks X										
Text 1			Hi Mom, when you're pregnant it's very important for both of us that you find ways to relieve stress.	X	X	X			X	X		

APPENDIX I

Whispers2Mom Survey Questions

Whispers2Mom Survey Questions

The following questions ask about the Whispers2Mom text messages.
Please circle the number that is best for you.

A. If you had known about the Whispers2Mom texts before this study, how likely would you have been to sign up for it?

Not at all likely   **Very likely**

1   2   3   4   5   6   7   8   9   10

B. How much would you recommend the Whispers2Mom texts to a family member or friend?

Not at all   **Very much**

1   2   3   4   5   6   7   8   9   10

C. How difficult was it to use the Whispers2Mom text program?

Not at all difficult   **Very difficult**

1   2   3   4   5   6   7   8   9   10

D. How informative do you think the texts were?

Not at all   **Very informative**

1   2   3   4   5   6   7   8   9   10

E. How helpful do you think the texts were?

Not at all helpful   **Very helpful**

1   2   3   4   5   6   7   8   9   10

Whispers2Mom Question #2, Step #4 Analysis

Whispers2Mom Question #2, Step #4 Analysis

"Was there anything about the texts that impressed you?"			
Q#2	**Subthemes**	**Codes**	**Number of responses**
	Positive/Affirmation	Impressed by all of it	1
	Information	Information, More than baby's development, Suggestions for mom, too	2
	Connecting text to stage	Connection related to stage, Stage that you're at, Fits well	1
	Cute	Cute	2
	Timing	Timing, Regular time every day	2
	Reminders	Reminders	1
	Guide you	Guide you	1
	Beneficial	Beneficial	1
	Format	Format, Short, Sweet, To-the-point, The way they were delivered	4
	Similar	Similar, Similar to other apps	2
	Complement	Complement each other	2
	Simple	Simple	1
	Fun	Fun	1

The numbers above represent individual responses from participants. There were 21 responses.

APPENDIX K

Whispers2Mom Interview Question #2, Step #5 Analysis

Whispers2Mom Interview Question #2, Step #5 Analysis

Question: Was there anything about the texts that impressed you?

Definition of impressed: deeply or markedly affected or influenced

https://www.vocabulary.com/dictionary/impressed

Participants were impressed with text messages based on categories related to:

- Information within texts (what they read, content of texts)
- Timing of the texts (when they read it, timing)
- Format of the texts (how it looked, presentation)

Subthemes that emerged (21 responses total):

- What info was provided (content)- 11 responses
- When info was provided (timing)- 2 responses
- How info was presented (presentation)- 8 responses

In summary, the participants were impressed by three main things: content, timing, and presentation of the text messages

Quotes:

"They came at a regular time every day."

"It was not just like the obvious stuff that you are told about."

"They're short, sweet, and to-the-point, which is nice."

"That it wasn't just about baby's development… suggestions for mom like 'make sure…', 'ask your doctor about back problems', or 'sleep on your left side.' Things you don't always think about."

Relationships between Themes, Subthemes, and Codes
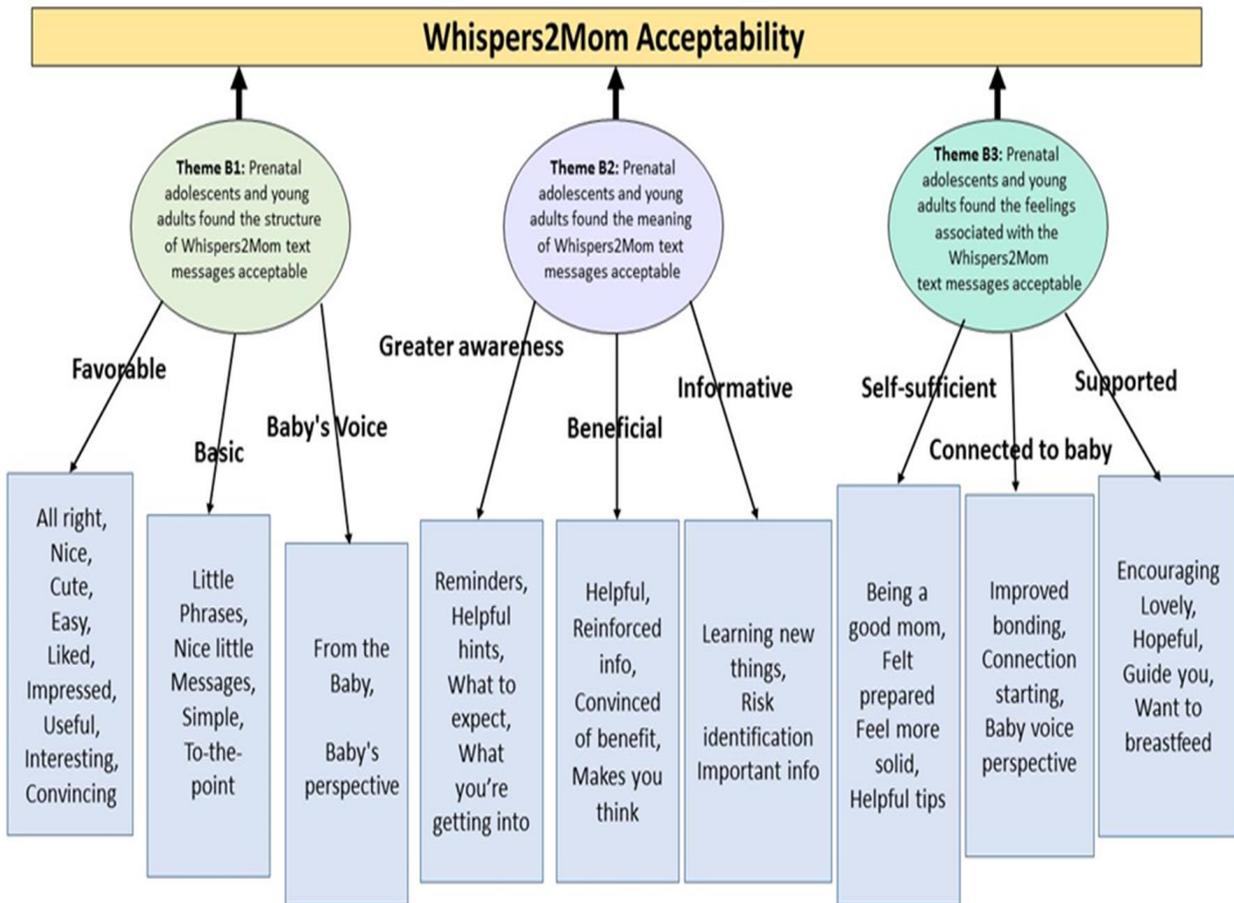
APPENDIX M

Focus Group/Interview Guide

Whispers2Mom Focus Group/Interview Guide

I. Welcome and introductions.
I will plan for 20-30 minutes for obtaining consents and filling out surveys.
- *Participants will be greeted as they arrive.*
- You will arrive at the organization and be assigned a number (101, 102, 103, etc.) when you sign up for the research study. This number will be used to follow what you share during the discussion. We will not use your name so we can protect who you are.
- *They will be asked to sign the consent form.*
- *Read the consent form and give the participants an opportunity to ask questions. This form will identify the participant by name. I will also sign the consent form.*
- *Participants will be provided a demographic data form with an assigned number on it. The participant's name and assigned number will be written down on the one and only sheet that links the two, and this sheet will be closely protected.*
- We will start with answering a few questions (*hand out demographic data, Whispers2Mom survey, and Infant Feeding Intentions forms*). I will give you about 5-10 minutes to fill them out. This form will be collected as soon as it is completed.
- *Once all the participants have arrived, and the forms have been completed, we will begin the focus group, or the individual interview.*

II. Instructions
- The focus group will last about 60-90 minutes. The one-on-one interview may take a little less time.
- Your baby is welcome to come with you. If you need to leave to take care of your baby, please feel free to do so. Just come back at any time to rejoin the group.
- I'd like *you* to do the talking, and I'd like everyone to participate. You may be called on if I haven't heard from you in a while.
- There are no right or wrong answers, and every person's experience and opinions are important. Please speak up whether you agree or disagree. I'd like to hear a wide range of opinions.
- What is said in the room stays in the room. I want you to feel comfortable sharing. You have the right to not answer a question you don't feel comfortable answering.
- I will be tape recording the group/individual discussions. I hope to get everything you have to say. I won't identify anyone by name in my report. You will remain anonymous.

- Parts of the recording of the session will be put in written form, without identifying who is speaking. The recording will be erased when the research study has ended.
- When we finish asking questions, come up to sign a sheet, receive your gift card, and then you may leave.

III. Questions for discussion
1. Overall what did you think about the Whispers2Mom text messages?
2. Was there anything about the texts that impressed you?
3. How often did you read the texts?
4. What did you think about how often the texts were sent? (Too much, just right, not enough. That is interesting. Can you tell me more about that?)
5. Was there anything about the texts that disappointed you?
6. If you would recommend the texts, what would you say about it to your family member or friend?
7. If you would not recommend the texts, what would you say about it to your family member or friend?
8. What three words would you use to describe the texts?
9. How did the texts make you feel? For instance, did you feel ashamed, empowered, guilty, judged etc.?
10. Was there anything about the texts that frustrated you?
11. I'm not sure you noticed, but the texts were worded as if the baby was talking to you. How did that make you feel?
12. How did these texts make you change how you feel about your baby?
13. Do you have any suggestions on how to improve the texts?

Now I would like to hand out a list of the breastfeeding texts for you to look over. Feel free to make notes on the forms if you'd like to do so. I will give you 5-10 minutes to look them over *(hand out a breastfeeding texts sheet to each participant).*

14. What did you think about the breastfeeding texts?
15. How did the breastfeeding texts make you feel?
16. How did you feel about how often the breastfeeding texts were sent?
17. Is there anything you would change about the breastfeeding texts?
18. Would you like to continue receiving the texts?

IV. Closing and thank you.
Are there any further questions or comments for me? If not, please collect your gift card.
Thank you!
Participants will sign the sheet and pick up their gift card.

APPENDIX N

Whispers2Mom Website

Whispers 2 Mom

What is Whispers2Mom?

Whispers2Mom is a project completed through Marian University which sends text messages to expectant mothers. It is to be used as an educational tool to enhance the health of the mother and baby. The text messages contain information that is helpful to the expectant mother and help facilitates bonding with the soon to be born child. Each week of pregnancy the woman will receive messages regarding fetal development, healthy foods to consume, exercise, stress reduction, and bonding.

How Do I Get Started?

In order to receive text messages, just enter in your name, phone number and weeks gestation in order to tailor the text messages to your specific needs. Text messages are not free, standard text messaging rates apply through your individual provider.

Which one best describes you?

http://whispers2mom.apl.wisc.edu/

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