Reducing Psychological Stress in Peripartum Women With Heart Rate Variability Biofeedback

A Systematic Review

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Peripartum women are exposed to a variety of stressors that have adverse health consequences for the maternal–child dyad (e.g., impaired bonding). To combat these adverse health consequences, heart rate variability biofeedback (HRVBF) may be implemented by holistic nurses to aid peripartum women experiencing a high level of stress. A systematic review was completed using the guidelines established in the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statement. To be included in the review, studies had to meet the following criteria: (a) published scientific articles, (b) studies published in English, (c) experimental, quasi-experimental, or case reports, (d) use of HRVBF as the main treatment, (e) use of psychological stress as a dependent variable, and (f) studies published until December 2017. The major findings of this review can be described as follows: (a) HRVBF and psychological stress in peripartum women are related concepts, (b) peripartum women who completed HRVBF report a reduction in stress compared with participants who did not receive HRVBF, and (c) there is currently no information on the effectiveness of HRVBF on psychological stress in the first and early second trimester of pregnancy. Overall, this systematic review of the literature provides objective evidence that HRVBF may be a potential beneficial adjuvant treatment for stress management in peripartum women.

Keywords: women; group/population, biofeedback; healing modalities, stress management/relaxation; healing modalities, stress and coping; common themes

Critical Reviews

Introduction

Compared with the general population, peripartum women (defined as pregnant and early postpartum, i.e., <6 months postdelivery) are exposed to multiple psychological stressors resulting from imminent role change (e.g., parenthood), financial burden (e.g., costs associated with having a baby), and physical manifestations of peripartum life (e.g., nausea, fatigue) (Lobel, DeVincent, Kaminer, & Meyer, 2000; Lobel et al., 2008; Mulder et al., 2002; Staneva, Bogossian, Morawska, & Wittkowski, 2017; Staneva, Morawska, Bogossian, & Wittkowski, 2016). These psychological stressors have the potential to permanently alter the maternal–fetal physiology and catalyze long-standing health issues for the dyad (Abbaszadeh et al., 2013; DiPietro, 2012; King & Laplante, 2005; Shapiro, Fraser, Frasch, & Séguin, 2013). The range of potential health issues is multisystemic and includes greater risk of postpartum depression, impaired maternal–child bonding (Giurgescu et al., 2015; Grote et al., 2010), and poor birth outcomes (Clemens & Dibben, 2017; Hobel, Goldstein, & Barrett, 2008; McKee, Seplaki, Fisher, Groth, & Fernandez, 2017).

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These poor health outcomes are largely preventable as there are biologic mechanisms that respond to maternal psychological stressors to keep the mother and the fetus from developing disease. One of the mechanisms that respond to stressors is the autonomic nervous system (ANS) (Dishman et al., 2000; Thayer & Lane, 2000). The ANS responds to stressors by altering the heart rate—meaning the more alterations there are in heart rate, the healthier the individual is (Brugnera et al., 2018; Goessl, Curtiss, & Hofmann, 2017; Task Force, 1996; Thayer, Friedman, & Borkovec, 1996). Consequently, the beat-to-beat variations of heart rate, called heart rate variability (HRV), are a reliable, noninvasive marker of an individual’s perception of and response to stressors (Brugnera et al., 2018; Föhr et al., 2017; Goessl et al., 2017; Task Force, 1996; Thayer & Lane, 2000). HRV has long been regarded as a marker of overall physical and mental health (Goessl et al., 2017; Task Force, 1996). Specifically, individuals with greater HRV tend to live longer (Boudoulas, Borer, & Boudoulas, 2015; Singh et al., 1999; Zulfiqar, Jurivich, Gao, & Singer, 2010) and have a lower incidence of physical (Singh et al., 1999; Tsuji et al., 1996) and mental (Carney & Freedland, 2009; Gorman & Sloan, 2000) disease.

It has been well established over decades of research that greater HRV is a protective factor against physical and mental disability and disease (Singh et al., 1999; Task Force, 1996; Tsuji et al., 1996); however, HRV in the peripartum period is greatly diminished across gestation (Carpenter, Emery, Uzun, Rassi, & Lewis, 2016). The reason for the marked decrease in HRV in the peripartum period remains unknown; however, a variety of hypotheses exist (e.g., Christian, 2012). Moreover, to combat the attenuation of HRV, health professionals often advise that peripartum women remain as relaxed as possible during this potentially vulnerable time period to prevent their ANS from becoming overtaxed (DiPietro, Mendelson, Williams, & Costigan, 2012). As such, over the past two decades, a variety of interventions have been developed to encourage relaxation, increase HRV, and subsequently promote overall health in the peripartum woman and her child. One of the many practices available that are known to increase HRV and subsequently reduce stress in other populations (Ahmad, Tejuja, Newman, Zarychanski, & Seely, 2009; Gevirtz, 2013) is heart rate variability biofeedback (HRVBF). HRVBF is a promising complementary/alternative modality for symptom reduction in a variety of diseases and disorders, including but not limited to chronic obstructive pulmonary disease, cyclic vomiting, fibromyalgia, hypertension, depression, insomnia, and muscle pain (Ahmad et al., 2009; Gevirtz, 2013). HRVBF is hypothesized to strengthen homeostasis in the baroreceptor, resulting in increased HRV and improved health (Lehrer et al., 2003). HRVBF focuses on maximizing HRV by aligning breaths and heart rate. For example, longer exhalations and slower respirations increase HRV (Guzil & Romanchuk, 2017; Song & Lehrer, 2003; Strauss-Blasche et al., 2000; Weinschenk et al., 2016).

HRVBF is readily available to be integrated into holistic nursing practice as there are several well-established intervention delivery systems (e.g., smartphone applications). Furthermore, the practice of HRVBF simply involves breathing exercises, therefore HRVBF can be practiced in a variety of settings and has been adapted to a number of interfaces, like smartphones (e.g., Elite HRV). Most existing HRVBF programs use paced breathing to achieve maximized HRV by displaying the heartbeats on a screen during slow breathing. While the practice of HRVBF is known to be associated with a variety of health benefits in healthy populations, such as mental and physical resiliency (Gorman & Sloan, 2000; Henderson et al., 2004; Lehrer & Gevirtz, 2014), stress reduction (Brugnera et al., 2018; Föhr et al., 2017; Goessl et al., 2017), and reduced depressive symptoms (Kemp et al., 2010; Zauszniewski, Tsay-Yi, & Musil, 2013), the health benefits for peripartum women remain understudied.

**Purpose**

Therefore, the purpose of this systematic review is to review and assess the evidence in support of the use of HRVBF to reduce psychological stress in peripartum women.

**Methodology**

**Search Procedure**

A literature search was conducted between October and December 2017 using the following keywords: biofeedback, HRV biofeedback, heart rate variability biofeedback, antenatal, maternal, perinatal,
pregnancy, pregnant, prenatal, antepartum, and postpartum. The following electronic databases were searched using Smart Text: Academic Search Complete, PubMed, Medline, Psychinfo, and CINAHL. A manual search for references was also conducted. No restrictions were set on the insertion date ranges of each database. Documents that were not initially located in full-text form were requested from the authors. All the responses were tracked. The guidelines established in the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statement (Moher, Liberati, Tetzlaff, & Altman, 2009) were followed in the preparation of this review. All the references were managed in EndNote. Data of interest (database, title of article, exclusion and reason) were extracted systematically and organized in a Microsoft Word document (see the appendix). The following keywords and MeSH terms were used within all the databases listed above: (heart rate variability biofeedback or HRV biofeedback or biofeedback) AND (antenatal or maternal or perinatal or pregnancy or pregnant or prenatal or antepartum or postpartum).

Eligibility Criteria

To be included in the systematic review, studies had to meet the following criteria: (a) published scientific articles, (b) studies published in English, (c) experimental, quasi-experimental, or case reports, (d) use of HRVBF as the main treatment, (e) use of psychological stress as a dependent variable, and (f) studies published until December 2017. Proceedings of conferences were excluded from this review.

Selection of Studies and Extraction of Data of Interest

The procedure for searching for and selecting the studies was performed independently by one author, who followed a strict protocol for inclusion of studies in this review. All references and full-text articles were stored in EndNote. In the preparation of this systematic review, a systematic review by Jimenez Morgan and Molina Mora (2017) was referenced as a guide for the selection of data points. Data extracted from the articles were country of publication, year of publication, age of the participants, trimester or months postpartum, sample size, study design, measured variables, intervention characteristics, and main study results.

Results

Figure 1 is the flowchart of the search for and selection of the studies for this review. Of the 563 initial records, only 2 studies were included for review. The list of excluded documents (n = 561) with the reasons for exclusion can be found in the appendix. The most common reason for initial exclusion was that the manuscript was off topic (e.g., urinary incontinence). Moreover, of the 30 full-text articles selected for inclusion, the majority were excluded because of the type of treatment used. That is, the treatment used was biofeedback but not specifically HRV-focused biofeedback (e.g., electromyography-focused biofeedback; see, e.g., Bernat, Wooldridge, Marecki, & Snell, 1992; St James-Roberts, Chamberlain, Haran, & Hutchinson, 1982).

The second most common reason for initial exclusion was the type of study conducted. That is, studies were excluded from the review because they were a type of literature review (Marc et al., 2011; Spence, Barnett, Linden, Ramsden, & Taenzer, 1999) or editorials about the nuances or benefits of HRVBF (e.g., Nichols, Gergely, & Fonagy, 2001). However, the next most common reason for exclusion was that the dependent variable of the study was not stress related. Examples of the dependent variables not related to psychological stress were hypertension (Little et al., 1984; Somers, Gevirtz, Jasin, & Chin, 1989) and pelvic pain (Duchene, 1989; Lee & Choi, 2006). Table 1 describes the main characteristics of each study included in this review (n = 2).

Design

The sample size of this systematic review was between 48 and 55 participants with ages ranging from 29 to 33.4 years and gestational ages ranging from 24 to 39 weeks, or the second (T2) and third (T3) trimesters (Kudo et al., 2014; Siepmann et al., 2014). Both the studies reviewed used an experimental design, meaning that both studies included a control group in their methodology. However, Kudo and colleagues (2014) opted for a two-group comparison where the control group received no treatment and the experimental group was instructed to practice biofeedback exercises with the StressEraser© (Helicor, 2007). Both the experimental and the control group completed T2 data collection at 4 days postpartum, and T3 data were collected at 1 month postpartum (Kudo et al., 2014). Similarly, Siepmann and col-
leagues (2014) also conducted a two-group comparison where the control group received a control condition and the experimental group received biofeedback with the StressBall© (Biosign, Ottenhofen, Germany). Both the experimental and the control groups received the treatment at the same duration and frequency, with additional follow-up occurring before the treatment, immediately after the treatment, and at 4 weeks postpartum (Siepmann et al., 2014).

**Control of Confounders**

Like many biomarkers, HRV also follows a diurnal rhythm, or a predictable biologic pattern of peaks and troughs throughout the day (Kim, Yoon, & Cho, 2014). Specifically, HRV peaks in the early morning and gradually decreases throughout the day (Kim et al., 2014). Furthermore, HRV is heavily influenced by a participant’s physical position during data collection (D’Silva, Davies, Emery, & Lewis, 2014). The best position to obtain the most accurate HRV reading is supine rest because all other positions (e.g., supine standing) result in significant fluctuations in HRV that may not be representative of the true value (D’Silva et al., 2014; Lowenstein et al., 2014; Schäfer et al., 2015). Subsequently, the two studies in this review controlled for the diurnal rhythm of HRV by the investigators collecting baseline HRV data with a wave pulse ear clip as well as by requiring participants to sit upright and rest for approximately 10 minutes before HRV analysis (Kudo et al., 2014; Siepmann et al., 2014).
In addition to controlling for positioning, Siepmann and colleagues (2014) opted to collect a detailed medical history and perform a physical exam in conjunction with baseline labs and a 12-lead baseline electrocardiogram. Conversely, Kudo and colleagues (2014) opted to strictly control for the diurnal rhythm of HRV and collected HRV data between 10 a.m. and 12 p.m., ensuring that the participants did not drink, eat, or smoke 2 hours prior to data collection.

### Variable Conceptualization and Operationalization

In this systematic review, psychological stress was conceptualized in a variety of ways, including perinatal anxiety, chronic stress, and symptomatic distress between studies (Kudo et al., 2014; Siepmann et al., 2014). Psychological stress was also operationalized using a variety of psychometric instruments, including the Edinburgh Postnatal Depression Scale (EPDS), the Trier Inventory for the Assessment of Chronic Stress (TIACS), and the Brief Symptom Inventory (BSI). In addition, the HRVBF interventions varied slightly across studies. The equipment used to deliver the HRVBF interventions were the StressEraser (Helicor, 2007) and the StressBall (Biosign, Ottenhofen, Germany). Both studies used the protocols provided by the HRVBF device company of their choosing (e.g., Helicor’s instructions for using the StressEraser). Furthermore, Kudo and colleagues (2014) and Siepmann and colleagues (2014) measured different HRV parameters. Kudo and colleagues (2014)
collected standard deviation of the R-to-R interval (SDNN), high frequency (HF), and low frequency power (LF) whereas Siepmann and colleagues (2014) only collected root mean square of the successive differences (RMSDD).

**Concurrence of the Findings**

Both studies reported HRVBF to be a successful stress reduction technique for peripartum women (Kudo et al., 2014; Siepmann et al., 2014). Specifically, Siepmann and colleagues (2014) reported that the participants in the experimental group had a lower stress level than the participants in the control group; however, this difference did not reach statistical significance. Furthermore, the participants in the control group had a higher rate of premature birth than those in the experimental group (Siepmann et al., 2014). Similarly, Kudo and colleagues (2014) reported that there were significant differences between the experimental and control groups on measures of HRV and psychological stress at T2 (i.e., 4 days postpartum) and T3 (i.e., 1 month postpartum). Additionally, stress scores and HRV (specifically SDNN/HF HRV parameters) scores were negatively correlated, meaning that as a participant’s HRV increased, her psychological stress decreased (Kudo et al., 2014). The participants in the experimental group also experienced a greater decrease in stress and depressive symptoms in the postpartum period than those in the control group (Kudo et al., 2014). The main results in each study for all the variables can be found in Table 1.

**Discussion**

This is the first review of HRVBF as a stress reduction technique for peripartum women. The purpose of this systematic review was to evaluate if there is objective, scientific evidence that supports the use of HRVBF to alleviate stress in peripartum women. Evidence of the potential benefits of practicing HRVBF in the general population is vast and plentiful (see the review by Gevirtz, 2013). Conversely, there are only two studies in the extant literature that describe the effects of practicing HRVBF as a stress reduction technique in peripartum women (Kudo et al., 2014; Siepmann et al., 2014). According to the findings of the studies included in this review, it is clear that HRVBF may be a useful adjuvant treatment for peripartum women experiencing a high level of stress. HRVBF is a noninvasive, simple to use, readily adapted tool for a variety of platforms (i.e., smartphones); it is accessible, and often free, for users. HRVBF may be utilized to evaluate a participant’s real-time stress level. or participants may opt to practice HRVBF in order to decrease their physiologic and psychological stress levels.

The major findings of this review can be described as follows: (1) HRVBF and psychological stress in peripartum women are related concepts, (2) peripartum women who completed HRVBF report a reduction in stress compared with participants who did not receive HRVBF, (3) there is currently no information on the effectiveness of HRVBF on psychological stress in the first and early second trimesters of pregnancy. Although Kudo and colleagues (2014) and Siepmann and colleagues (2014) arrived at the same conclusion that HRVBF may be a beneficial tool for stress reduction in peripartum women, they arrived at this conclusion using separate approaches.

**HRV and the Peripartum Period**

There are several factors that influence HRV in peripartum women, because of the substantial changes in the maternal cardiovascular system to support fetal development during pregnancy. Such changes include an increase in blood volume (Mahendru et al., 2012), an increase in stroke volume and heart rate, and an increase in cardiac output (Chamchad, Horrow, Nakhamchik, & Arkoosh, 2007; Melchiorre, Sharma, Khalil, & Thilaganathan, 2016). Most of the cardiac changes occur in the first and second trimesters, with cardiac alterations plateauing in the third trimester (Sanghavi & Rutherford, 2014). Despite all of the increases in cardiac status listed above, HRV markedly decreases in pregnancy across gestation (Gandhi et al., 2014; Kher & Desai, 2015; Reyes-Lagos et al., 2015).

Siepmann and colleagues (2014) and Kudo and colleagues (2014) differ in their inclusion and definition of peripartum women. Siepmann and colleagues (2014) only recruited pregnant women between 24 and 32 weeks of gestation who were in preterm labor and followed them into the postpartum period. Meanwhile, Kudo and colleagues (2014) included women in their early postpartum period, which means that there is a large gap in knowledge on the effectiveness of HRVBF for stress management in women before 24 weeks of gestation. It is widely known that most of fetal development occurs during
the first trimester (i.e., <13 weeks’ gestation) (Goletzke et al., 2017) and that maternal psychological stress during this time poses a great risk of altering this vital development (see the review by Vesterinen, Morello-Frosch, Sen, Zeise, & Woodruff, 2017). Therefore, future studies need to consider testing HRVBF as an intervention during this critical development period (i.e., before 24 weeks of gestation).

Demographics and HRV

There are several well-known factors that can alter HRV, including time of day (Armstrong, Kenny, Green, & Seely, 2011; Nunan, Sandercock, & Brodie, 2010), exercise (Routledge, Campbell, McFetridge-Durdle, & Bacon, 2010), diet (Sauder, Johnston, Skulas-Ray, Campbell, & West, 2012), caffeine intake (Koenig et al., 2013), and smoking (Barutcu et al., 2005; Karakaya et al., 2007). There are also several demographic characteristics that predispose individuals to alterations in HRV, including age, sex, and race/ethnicity. For example, as one ages, one’s HRV naturally decreases, which has been hypothesized to result from the reduced responsiveness of the ANS to the environment (Bobkowski et al., 2017; Vasicko, Prindesova-Busikova, & Osina, 2016) or aging receptors in the ANS (Voss et al., 2000). Additionally, females typically have lower HRV because of the hormonal effects of estrogen on the cardiovascular system (see the review by Von Holzen, Capaldo, Wilhelm, & Stute, 2016) or because of different lifestyle choices (Bianchim et al., 2016; Tegegne, Man, van Roon, Riese, & Snieder, 2018). Furthermore, African Americans have higher HRV when all other factors are controlled for (Fuller-Rowell et al., 2013; Hill et al., 2015); however, this is confounded by the rates of hypertension, diabetes mellitus, elevated cholesterol, physical inactivity, overweight, and current smoking, all of which are highest in prevalence among African Americans (Centers for Disease Control and Prevention, 2014; Keenan & Shaw, 2011).

Control of Confounders

Because of the large number of potential confounders of HRV in healthy populations and even more in peripartum samples, investigators must decide what characteristics they choose to exclude and which characteristics they will control for statistically.

Kudo and colleagues (2014) and Siepmann and colleagues (2014) conjointly controlled for singleton delivery, substance use, and health status. Other environmental characteristics that were controlled for in both studies were diurnal rhythm (i.e., data collection between 10 a.m. and 12 noon), behavioral factors (no drinking, smoking, or eating in the previous 2 hours), and positioning (i.e., supine position) (Kudo et al., 2014; Siepmann et al., 2014). Additionally, Kudo and colleagues (2014) also statistically controlled for maternal age, method of delivery, parity, blood pressure, and body mass index, and Siepmann and colleagues (2014) statistically controlled for the use of certain medications (e.g., beta blocker).

Measurement of HRV

Many experts in the HRV field recommend measuring HRV for 24 hours to control for a variety of factors (e.g., time of day) and to obtain an average HRV rather than a random, single–time point measurement of HRV (Nunan et al., 2010). Neither study in this systematic review implemented 24-hour ambulatory HRV monitoring, which may have led to inaccurate findings. Another important difference between the studies that affects comparability and generalizability is that different HRV parameters were used and compared across the studies. Kudo and colleagues (2014) used a variety of parameters (e.g., HF, LF, SDNN), whereas Siepamann and colleagues (2014) used only one parameter (i.e., RMSSD). Each HRV parameter corresponds to a specific aspect of HRV and is measured differently, limiting the accuracy of comparisons across the studies. Instead, future studies may opt to examine multiple HRV parameters but, for example, always include RMSSD or SDNN because they are standardized measures that represent overall parasympathetic control (Task Force, 1996). The standardization of these measures (e.g., RMSSD or SDNN) lends itself to comparisons across studies. However, other measures such as HF and LF are highly sensitive and respond greatly to multiple factors, resulting in a lack of standardization, and therefore may not be ideal to compare across studies.

Defining and Measuring Stress

Furthermore, Kudo and colleagues (2014) and Siepmann and colleagues (2014) greatly differ in
their conceptual and operational definitions of psychological stress. Kudo and colleagues (2014) define psychological stress as a combination of maternity blues and perinatal anxiety, whereas Siepmann and colleagues (2014) define psychological stress as a trifold concept encompassing symptomatic distress, state and trait anxiety, and chronic stress. Obviously, these concepts are completely different and are subsequently measured differently and may not be comparable. Surprisingly, no study in this systematic review used the gold standard of stress measurement, the Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1983), or a stress measure that is sensitive to changes in pregnancy, such as the Pregnancy Experience Scale (DiPietro, Christensen, & Costigan, 2008) or the Prenatal Distress Questionnaire (Yali & Lobel, 1999). This lack of agreement on the conceptual and operational definitions of stress can be detrimental to uncovering if HRVBF is useful in alleviating stress in peripartum women. There is an urgent need to use consistent measures and definitions to allow for comparisons across studies.

**Methodology and Design**

**Differences**

Kudo and colleagues (2014) and Siepmann and colleagues (2014) again differ in the HRVBF intervention delivery method as well as the dose of HRVBF. Kudo and colleagues (2014) opted to use the StressEraser (Helicor, 2007), a pocket-sized device that displays waves on a screen, which participants are guided to synchronize their breathing with. Alternatively, Siepmann and colleagues (2014) chose to use the StressBall, which has a computer screen that displays a balloon and participants must control the balloon’s movement with their breathing.

Moreover, neither study in the present review included the HRVBF study protocol. This is not surprising because according to a recent systematic review of the effectiveness of HRVBF in athletes, only 42% of the studies reviewed used a standard protocol (Jimenez Morgan & Molina Mora, 2017). In fact, Jimenez Morgan and Molina Mora (2017) suggest that investigators interested in implementing HRVBF should use a standardized protocol provided by Lehrer and colleagues (2013). Lehrer and colleagues’ HRVBF protocol involves practicing HRVBF over a 10-week time frame, with specific guidelines on dosing (e.g., 20 minutes once a day) and setting (e.g., in the laboratory vs. at home). However, although Lehrer and colleagues’ standard protocol may be applicable to healthy subjects, it may not be generalizable to or appropriate for peripartum women, so future research may consider developing a protocol specifically for peripartum women.

**Evidence of Effectiveness**

Although there are substantial differences in the sample, design, conceptual and operational definitions of measurement, HRV parameter operationalization, and HRVBF protocol, there are similar results in the studies of Kudo et al. (2014) and Siepmann et al. (2014). Both studies provide preliminary evidence for the use of HRVBF as an adjuvant stress reduction technique in peripartum women. In particular, Kudo and colleagues (2014) report significant differences in HRV between the participants who received HRVBF and those who did not. These differences are also apparent in the depressive symptom scores as well as stress scores (lower depressive symptoms and stress in the HRVBF group) (Kudo et al., 2014). Collectively, the participants in both studies who received HRVBF training had lower depressive symptom scores (Kudo et al., 2014) and chronic stress (Siepmann et al., 2014) in the postpartum period, but findings in the antepartum period are mixed. For example, Siepmann and colleagues (2014) found no differences in anxiety, stress, depressive symptoms, or birth outcomes in the groups in preterm labor between those who received HRVBF and those who did not, whereas Kudo and colleagues (2014) reported significant differences between the groups on measures of depressive symptoms, stress, and HRV.

**Implications for Holistic Nursing**

This rigorous systematic review of the literature has vital implications for the field of holistic nursing as this review serves as foundational work for future research and practice. While there are only two HRVBF intervention studies in pregnant women to date, there are several decades of research on the effectiveness of HRVBF for stress reduction in non-pregnant samples. As the science of complementary or alternative therapies as an entity advances, there is a considerable amount of understanding regarding the mechanism of action for therapies like HVBF. This continued research into HRVBF lends
credibility to the professional and public acceptance of and attitudes toward HRVBF as a treatment modality (Liu et al., 2009).

Before implementing a complementary therapy such as HRVBF, nurses should be knowledgeable about the effectiveness of the modality in the population/clientele of interest. At a minimum, pilot effectiveness trials should be completed, and systematic reviews should synthesize these trials into a comprehensive document, which holistic nurses can review before putting a complementary modality into practice (Cornman, Carr, & Heitkemper, 2006). The recommendation for holistic nurses to appraise evidence of modalities aligns with Standard 13 of the Holistic Nursing Scope and Standards of Practice, which states that a holistic nurse should integrate research into practice by utilizing the best available evidence in the literature (American Holistic Nurses Association, 2013; Mariano, 2013).

According to the Holistic Nursing Scope and Standards of Practice, the scope of holistic nursing is defined by the interconnectedness of the body, the mind, emotions, the spirit, energy, social/cultural relationships, the context, and the environment (American Holistic Nurses Association, 2013; Mariano, 2013). Holistic nurses have a unique skill set or toolbox of modalities (e.g., HRVBF) that may affect these components of being human. This unique skill set includes the ability to establish caring and healing relationships, providing an environment that is inclusive and empowering clients to choose the healing modality that is best for them. The basis of this unique skill set is the fundamental assumption that people can heal themselves and that holistic nurses are not the healers but rather guide the participant to the modality that will bring about healing (American Holistic Nurses Association, 2013).

One of the most important tasks of a holistic nurse is to educate and inform patients about all of their health care options. For example, when a holistic nurse is working with a pregnant client who discloses a high level of stress and subsequent hypertension, the holistic nurse would assess the situation and provide ample treatment options, in addition to the physician’s orders, such as HRVBF. In this example, HRVBF could be readily taught in the outpatient setting, and the client may feel of a sense of empowerment and control in the intimidating circumstance. However, again, the role of the holistic nurse is to understand all the treatment modalities and empower clients to choose the modality best suited for them.

**Recommendations**

Based on the limited literature available, it appears that HRVBF may be a beneficial stress reduction method in peripartum women. Holistic nurses may implement HRVBF with caution, as only two studies currently exist within the literature. Future studies should either consider the use of an established HRVBF protocol (e.g., Lehrer et al., 2013) or develop an HRVBF protocol specifically for peripartum women. Additionally, there is a dearth of studies on the effectiveness of HRVBF in women in their first and early second trimesters. Researchers should consider not only studying HRVBF within this specific prenatal time frame but also implementing the measurement of HRV at each trimester and in the postpartum period to assess change and correlations with psychological variables. Likewise, with regard to measurement, future studies also need to carefully consider the conceptualization and operationalization of psychological stress and the HRV parameters. Choosing an appropriate measure is vital to making comparisons across studies, and when dealing with peripartum women, a measure of stress that is sensitive to changes in pregnancy is paramount.

**Conclusion**

Based on a rigorous review of the literature, there are currently two articles in the literature that address the research problem of testing HRVBF as a stress reduction intervention in peripartum women. There are significantly more literature and data on the postpartum period than on the prenatal period. Therefore, investigators and holistic nurses alike may consider studying and implementing HRVBF as a treatment for stress in the early prenatal period (first and second trimesters). Also, it should be noted that HRV is highly influenced by multiple factors (e.g., time of day) and there is a need to plan out intervention in a strategic manner to either environmentally or statistically control for these factors. In conclusion, this systematic review of the literature provides objective evidence that HRVBF may be a potential beneficial adjuvant treatment for stress management in Supplemental material (i.e. appendix of all studies reviewed) available upon request.
References


Ahmad, S., Tejuja, A., Newman, K. D., Zarychanski, R., & Abbaszadeh, F., Kafaei Atrian, M., Masoudi Alavi, N.,...


309-318.


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