Music elements addressing selected physiological breastfeeding challenges: A systematic review

MM Kohn

orcid.org/0000-0002-3144-6844

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Supervisor:	Prof W Lubbe
Co-supervisor:	Dr A du Preez

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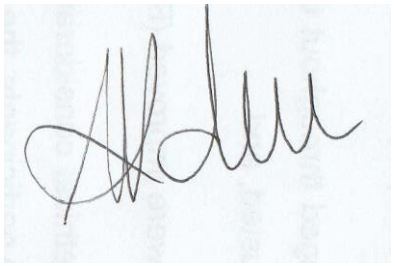
PREFACE AND DECLARATION

I, MM Kohn (20272979), a *Magister Curatonis* (M. Cur) student, declare that this dissertation is my original work. All sources used and quoted have been referenced appropriately. I confirm that I have read and understood the 2013 Policy on Plagiarism of the North-West University as well as the 2018 Policy on academic integrity.

I conducted all research and wrote the dissertation under the supervision of Prof W Lubbe and Dr A du Preez. Both Prof Lubbe and Dr du Preez acted as co-authors of the article, presented in Chapter 3 of this dissertation.

The article "*Music elements addressing selected physiological breastfeeding challenges: a systematic review"* will be submitted to the Journal of Human Lactation. The article was written according to the journal's author guidelines included in Annexure G of this dissertation. References for chapters one, two and four are presented according to the North-West University Harvard style at the end of the dissertation. References in the article (Chapter 3) are presented at the end of chapter three according to the specific journal's author guidelines. No copyright permission has been obtained from the editor of the journal, as this will be acquired should the article be accepted for publication.



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Finally, to my husband and children: words cannot describe how much your support meant to me. The completion of this dissertation came with sacrifices from all of us. You are my rock and this dissertation is dedicated to you.

SUMMARY

Background

Scientific information underlying the beneficial uses of therapeutic music has been widely published, but its application to enhance lactation and breastfeeding outcomes still need to be studied. Breastfeeding difficulties can be ascribed to pain, hormonal imbalance, stress, and anxiety experienced by the breastfeeding mother.

Pain experienced by the breastfeeding mother could cause early cessation of breastfeeding before the neonate reaches the age of six months. The neonate's suckling could cause pain or pain could be related to the birth process. Analgesics inhibit human milk production, making non-pharmacological pain management very important. The use of music reportedly could reduce the lactating woman's pain levels without using any analgesics. Increased secretion of oxytocin and prolactin hormones (improving human milk production) occurs when listening to music. Reduced levels of stress and anxiety, achieved while listening to music, could enhance lactation and breastfeeding outcomes.

However, limited research was found about the impact of listening to music on the physiology of lactation and breastfeeding outcomes.

Objectives

The study aimed to identify and describe the specific elements ideally comprising a music intervention programme for enhancing the physiology of lactation and breastfeeding outcomes.

Method

A systematic literature review was conducted to obtain evidence about specific musical elements influencing the physiology of lactation and breastfeeding outcomes.

Five phases were followed during the systematic review, namely (i) problem formulation, (ii) literature search and sampling, (iii) critical analyses, (iv) evaluation of data, and (v) data interpretation and presentation of results. The identified data sources were analysed and critically appraised according to the inclusion criteria and the Johns Hopkins Appraisal Instrument.

Results

The results of the systematic review indicated that music could have a positive effect on lactation and breastfeeding outcomes. Relevant musical elements were identified as slow, soft music with repetitive tempo replicating the normal heartbeat of a person (60-80 beats per minute). Also, without voices and

preferably using piano or string instruments. By stimulating a calming environment, music could help to decrease pain and reduce stress and anxiety levels.

Conclusion

Appropriate musical elements could enhance lactation and breastfeeding outcomes. Thus, music therapy could help to extend the duration of breastfeeding when used at home as a cost-effective strategy by the lactating mother.

Keywords:

Discontinue breastfeeding, breastfeeding challenges and physiological challenges, breastfeeding and difficulties, music and breastfeeding, music therapy and pain, music therapy and hormones, music therapy and stress

LACTATION-RELATED LANGUAGE USED IN THIS RESEARCH REPORT

The researcher used the following terminology indicated by the Human of Lactation (see annexure F) to align with international standards.

Breastfeeding	Not “nursing” nor “breast feeding.”
Expressing	Not “pumping.”
Human milk	Not “breast milk.”
Infant	Not “baby”
Milk ejection	Not “let-down”
Suckling	Not “sucking” (of the infant at the mother’s breast).

LIST OF ABBREVIATIONS

BP	Blood pressure
BPM	Beats per minute
CNS	Central nervous system
DL	Delayed lactation
DL II	Delayed lactogenesis II
DOH	Department of Health
EBF	Exclusive breastfeeding
EBP	Evidence-based practice
EPPI	Evidence of Policy and Practice Information
HDL	High-density lipoprotein
HPA	Hypothalamus-pituitary-adrenal
HR	Heart rate
HREC	Health Research Ethics Committee
HRV	Heart rate variability
INSINQ	Quality in nursing and midwifery
KMC	Kangaroo mother care
LDL	Low density lipoprotein
MDG	Millennium Developmental Goal
MeSH	Medical subject headings
MER	Milk ejection reflex
MRC	Medical Research Council (of South Africa)

MTAO	Music therapy association of Ontario
NuMIQ	Nursing and Midwifery Inquiry for Quality
NMDA	N-methyl-D-aspartate receptor
NWU	North-West University
PIM	Perceived insufficient milk
PIO	Population, Intervention, Outcome
PRISMA	Preferred reporting items for systematic reviews and meta-analyses
SDG	Sustainable developmental goals
SNS	Sympathetic nervous system
SR	Systematic review
ToC	Table of contents
UNICEF	United Nations Children's Emergency Fund
WHO	World Health Organization

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CHAPTER 1
OVERVIEW OF THE STUDY

1.1 INTRODUCTION

This chapter provides an overview of the study. It aims to present the best evidence available regarding the elements of music which could have a positive influence on the physiology of lactation and breastfeeding outcomes. Literature will be discussed about the research problem and question that guided the study in the background section. The aim and objectives are presented. The study comprises a systematic literature review. A discussion about the rigour of the study provides evidence of the reliability of the study's findings followed by the ethical considerations as prescribed by North-West University (NWU, 2016:20 - 23).

1.2 BACKGROUND INFORMATION

The key terms will first be described to set the scene for this study.

1.2.1 Definitions of Key Terms

Breastfeeding can be described as the method of feeding an infant directly from the mother's breast. The term **exclusive breastfeeding** is defined as an infant feeding method where the infant receives only human milk and no other form of feeding, except for medication, for the first six months of infant life (WHO, 2016:3 - 4).

Breastfeeding challenges are a collective term used to describe the difficulties or problems, either as experienced by the mother, or by the infant. These challenges can lead to cessation of breastfeeding (Neifert & Bunik, 2013:116).

Breastfeeding outcomes refers to the success of breastfeeding (Chaplin *et al.*, 2016:145). Breastfeeding outcome in this context refers to the success of breastfeeding at the end of six months of infant life.

Discontinuation of breastfeeding is the cessation of breastfeeding (Goosen *et al.*, 2014:13). Discontinuation of breastfeeding refers to the cessation of breastfeeding before six months of infant life in this context.

Emotional factors influencing breastfeeding refer to stress and anxiety experienced by the lactation mother (Jayamala *et al.*, 2015:3).

Physical factors influencing breastfeeding refer to pain experienced during the breastfeeding period, either related to nipple pain and/or physical pain related to the birthing process (Kelleher, 2006:2727).

Physiological factors influencing breastfeeding is a collection term developed for this dissertation. It is a combined term referring to physiological, lactation an emotional factors that may have an influence on breastfeeding.

Hormonal factors influencing lactation refers to breastfeeding difficulties specifically due to physiological challenges in the mother such as pain experience during lactation, a hormonal imbalance that can lead to difficulty during lactation, and maternal stress and anxiety.

Lactation is the term used to describe the production of milk by the mammary glands (Neifert & Bunik, 2013:116).

Lactogenesis is the production of human milk from colostrum to mature milk, containing two stages (Lawrence & Lawrence, 2015:56). Stage one can be identified by the presence of specific hormonal components which play an essential part in the production of human milk, like casein and lactose. Colostrum is produced during this stage and usually start during the last part of pregnancy (Neville *et al.*, 2001:35). Stage two is characterised by rapid changes in the composition of human milk during the first four days postpartum, followed by a slower fluctuation in the different components of human milk during the duration of lactation (Neville & Morton, 2001b:3006).

Milk ejection reflex refers to the release of milk by the breast. This release is triggered by the stimulation of the nipple, either from suckling by the infant or other tactile stimulation thereof. The stimulation of the nipple triggered the afferent and efferent pathway of milk. The afferent path refers to the path from the nipple to the hypothalamus, and the efferent the neurohypophysial release of oxytocin into the systemic circulation. Stimulation of the breast causes the myoepithelial contractions within the breast causing the release of oxytocin, resulting in the movement of milk into the milk ducts. This leads to the release of milk through the nipple (Stedman, 2006:266; Neifert & Bunik, 2013:115).

Therapeutic music is music that is used with specific nonverbal, creative, structural, and emotional elements that can help to improve and restore the mental, physical and emotional health of the listener (MTAO, 2010:1).

Systematic literature review collects and summarises all empirical evidence to answer the research question (Whittemore & Knafl, 2005a:546).

1.2.2 Background Information

The importance of breastfeeding, and more significantly exclusive breastfeeding (EBF), are well researched and presented in various studies (Neifert & Bunik, 2013:115; Odom *et al.*, 2013:e727; Tarrant *et al.*, 2014:1088). The most important significance of EBF can be seen in the reduction in neonatal morbidity and mortality rates (Du Plessis, 2016:110) in countries representing a high exclusive breastfeeding rate at six months. However, the statistics in South Africa are far from desirable when compared to other countries. Studies indicate that exclusive breastfeeding initiation rates are high in comparison to the very few infants who are exclusively breastfed by six months (Du Plessis, 2016:110). The research concluded that countless neonates are receiving complementary feeding before six months in South Africa, some even in the first few days of infant life (Du Plessis, 2016:111). The EBF rate for six months is found to be 6% in 2011 (Goosen *et al.*, 2014:14). These practices are leading to poor neonatal and young infant health in our country. Improve breastfeeding practicesare required to change poor feeding practices to improve the mortality rates in South Africa (Henriques, 2015:10). Consequently, the *Tshwane Declaration of Support for Breastfeeding in South Africa* was developed in 2011 to enhance the statistics on EBF at six months to reduce the mortality rate (DOH, 2011:214).

According to the Tshwane declaration, no free formula milk will be issued by any public facility unless a qualified health professional prescribes it. Furthermore, all infants should receive EBF until six months of age when solids can be introduced. The Tshwane Declaration further recommends continued breastfeeding up to the age of two years (Du Plessis & Pereira, 2013:S120) This declaration is developed to ensure that breastfeeding outcomes are reached in South Africa, as stipulated in the Millennium Developmental Goals (MDGs) in 2015 by the World Health Organisation and United Nations Children's Emergency Fund. As these goals were not met in 2015, they were replaced by the Sustainable Developmental Goals (SDGs) (WHO, 2016:6) where the goals were to improve child health and mortality up to five years of age.

The success of breastfeeding mostly depends on the experience the nursing mother has during the first few days post-partum (Hall *et al.*, 2014:259). A 60% breastfeeding cessation rate are reported globally with evidence indicating the reason as having either a physical, lactation (mechanical/structural), or emotional factor (Aluka-Arowolo & Adekoya, 2012:4671; Odom *et al.*, 2013:e729). The physical factor as experienced by the mother can be pain experienced from various sources, discomfort and soreness of the nipples or the delivery (Brownell *et al.*, 2012:608; Tully & Ball, 2014:712; Brown *et al.*, 2016:273). Some women indicated that the discomfort of breastfeeding had a negative impact on their relationship with their babies (Hobbs *et al.*, 2016:6). Contributing physical factors are perceived insufficient milk (PIM) supply by the

nursing mother, with a slow milk ejection reflex (McClellan *et al.*, 2012:513; Neifert & Bunik, 2013:118; Odom *et al.*, 2013:e730). When referring to emotional factors that can have a negative influence on breastfeeding duration, evidence indicate that stress and anxiety experienced by the nursing mother included negative maternal affectivity towards breastfeeding. Also, trauma experience during the delivery process can lead to high anxiety levels in a nursing mother. Breastfeeding difficulties could lead to post-partum depression (Chaput *et al.*, 2016:e106). This can have a negative impact on hormonal and pain factors and inhibit milk production (Geddes *et al.*, 2013:156; Fu *et al.*, 2015:2).

The production of human milk is either endocrine (hormonal) or autocrine (baby) driven. Endocrine production focuses on the hormones needed for producing human milk and the milk ejection reflex. On the other hand; autocrine human milk production followed the stimulation of the infant suckling on the breast (Ballard & Morrow, 2013:49).

Important hormones during human milk production are oxytocin, prolactin, oestrogen, adrenal corticoids (cortisol), insulin and growth hormones. Insufficient human milk supply can be caused by biological factors, though the psychological elements should not be underestimated (Meedya *et al.*, 2010:153). Human milk production increased when higher quantities of prolactin are released (De Lathouwer *et al.*, 2004:170).

The dopaminergic system regulates prolactin levels. Secretion of the hormone by the breast depends on the infant's suckling and stimulation. Prolactin binds to mammary epithelial cell receptors, stimulating the synthesis of milk proteins. Milk proteins were essential as they included cells, anti-infectious and anti-inflammatory agents, growth factors, and probiotics (Ballard & Morrow, 2013:50). Human milk is stored in the alveolar lumen of the breast until the ejection reflex is stimulated by the infant's suckling, stimulating the posterior pituitary gland to produce oxytocin. Oxytocin stimulates the contraction of myoepithelial cells surrounding the alveoli and ducts. This leads to milk ejection.

Lactogenesis is the process of human milk production from pregnancy through to full lactation. It involved a sequence of cellular changes whereby mammary epithelial cells were transformed from a non-lactation state to a lactation state (Neville & Morton, 2001a:3007). Lactogenesis consists of four stages. Lactogenesis I occur during mid-pregnancy and is the initiation of milk synthesis where prolactin stimulates mammary secretory cells to produce milk. Lactogenesis II takes place during the first four days post-partum and signals the beginning of copious milk secretion (Neville & Morton, 2001a:3007), and involves changes in milk composition and volume. Lactogenesis III, also known as galactopoietic, occurs when milk production has been established 14 to 30 days post-partum. Prolactin and oxytocin were essential for the effective

maintenance of the milk supply (Neville & Morton, 2001a:3008). Lactogenesis IV is known as involution and is the termination of milk production. This usually starts on the fourth day after the last breastfeeding or human milk expressing occurrence (Neville & Morton, 2001a:3007).

Music comes to mind when exploring interventions that effect similar processes as described in the breastfeeding context above. The calming effect of music had a positive influence on the overall breastfeeding physiological effect (Jayamala *et al.*, 2015:4). The musical effect can be seen in the three factors identified that lead to breastfeeding difficulties, namely (i) physiological factor as experienced by pain, (ii) lactation factor as experienced by a hormonal imbalance, and (iii) emotional factor experienced as anxiety and stress in the nursing mother (Odom *et al.*, 2013:e729).

Physiological stress effects are regulated by the central nervous system and by the sub-cortical process within the limbic system (Thoma *et al.*, 2013:e70156). The hypothalamic system incorporate two major stress systems, namely (i) the hypothalamus-pituitary-adrenal (HPA) axis, and (ii) the sympathetic nervous system (SNS). The hypothalamic system is also the physiological stress component of endocrine and autonomous responses (Thoma *et al.*, 2013:e70157).

It became evident through research that music can lower the sympathetic nervous system activity and vital physical data like the heart rate, blood pressure, oxygen consumption, and activate the release of endorphins to help the body to reduce the effect of negative feelings and emotions (Li & Dong, 2012:83). Therefore, it seems that music is affecting the same systems that are affected when breastfeeding problems are experienced, on a physical, lactation (hormonal), and emotional level. Substantial research has been done on the emotional effects of music, but less on the physical effect, which may also include hormonal responses.

1.3 RESEARCH PROBLEM

Breastfeeding difficulties could cause cessation of breastfeeding before the neonate reaches the age of six months and include pain, hormonal imbalance, stress and anxiety (Aluka-Arowolo & Adekoya, 2012:4671). The physiological effect of these difficulties has been researched to enhance the success rates of breastfeeding (Brownell *et al.*, 2012:608; Brown & Jordan, 2013:829). Music could offer a cost-effective way to address some of these issues. Past research focussed on the effect of music in specific settings on selected difficulties experienced (pain, hormonal imbalance, stress and anxiety), but did not always relate directly to breastfeeding (Odom *et al.*, 2013:e729; Jayamala *et al.*, 2015:4). The researcher identified a gap in research about the identification of musical elements that could influence physiological

lactation responses (of increased secretion of oxytocin and prolactin hormones) and enhance breastfeeding outcomes.

1.4 RESEARCH QUESTION

The following question arose during this research:

> *Which breastfeeding challenges can be linked to ineffective physiological responses and which musical elements could positively influence physiological responses, with specific reference to physical, hormonal and emotional factors, in the lactating woman to enhance lactation and breastfeeding outcomes?*

1.5 RESEARCH AIM AND OBJECTIVES

1.5.1 Aim

The research aimed to explore therapeutic musical elements that could influence the physiological responses like physical, hormonal and emotional factors in the lactating woman to improve breastfeeding outcome. These physiological responses should have a positive impact on pain, hormonal imbalance and stress and anxiety experienced by the lactating woman. The evidence collected during this study will support the development of a future programme to use therapeutic musical elements to enhance lactation and breastfeeding outcomes in a cost-effective method.

1.5.2 Objectives

To identify breastfeeding challenges that can be linked to ineffective physiological responses (low oxytocin and prolactin production) related to lactation and breastfeeding outcomes.

To identify specific musical elements that could enhance the physiological responses related to lactation and breastfeeding outcomes.

To formulate recommendations of musical elements that should be included when music is used as a therapeutic way to address selected breastfeeding challenges linked to ineffective physiological responses.

1.6 RESEARCH METHOD

A systematic review (SR) method was used to critically synthesise all available evidence on the topic of musical elements to address breastfeeding difficulties. This type of review was chosen as the literature included were exclusively from research studies. No other non-research sources, e.g. guidelines, were considerate for inclusion.

A systematic review (SR) is the assessment of all of the research done in a systematic and explicit method to answer the relevant research question. All information sources were identified, selected and appraised to determine the relevance to the review question before any document was included in the systematic review (Magarey, 2001:376). A combination of qualitative and quantitative data were included in the sample. This enabled a comprehensive data collection and data synthesis procedure to be performed (Whittemore & Knafl, 2005a:547).

A systematic review add added value to evidence-based practice (EBP) (Whittemore & Knafl, 2005a:546 - 553). A systematic review aimed to gather and identify relevant data of high-quality studies in an unbiased manner to provide a comprehensive understanding of the phenomenon that was being researched (Grove *et al.*, 2014:619). A systematic review approach enabled the researcher to reduce potential bias (Whittemore & Knafl, 2005a:553).

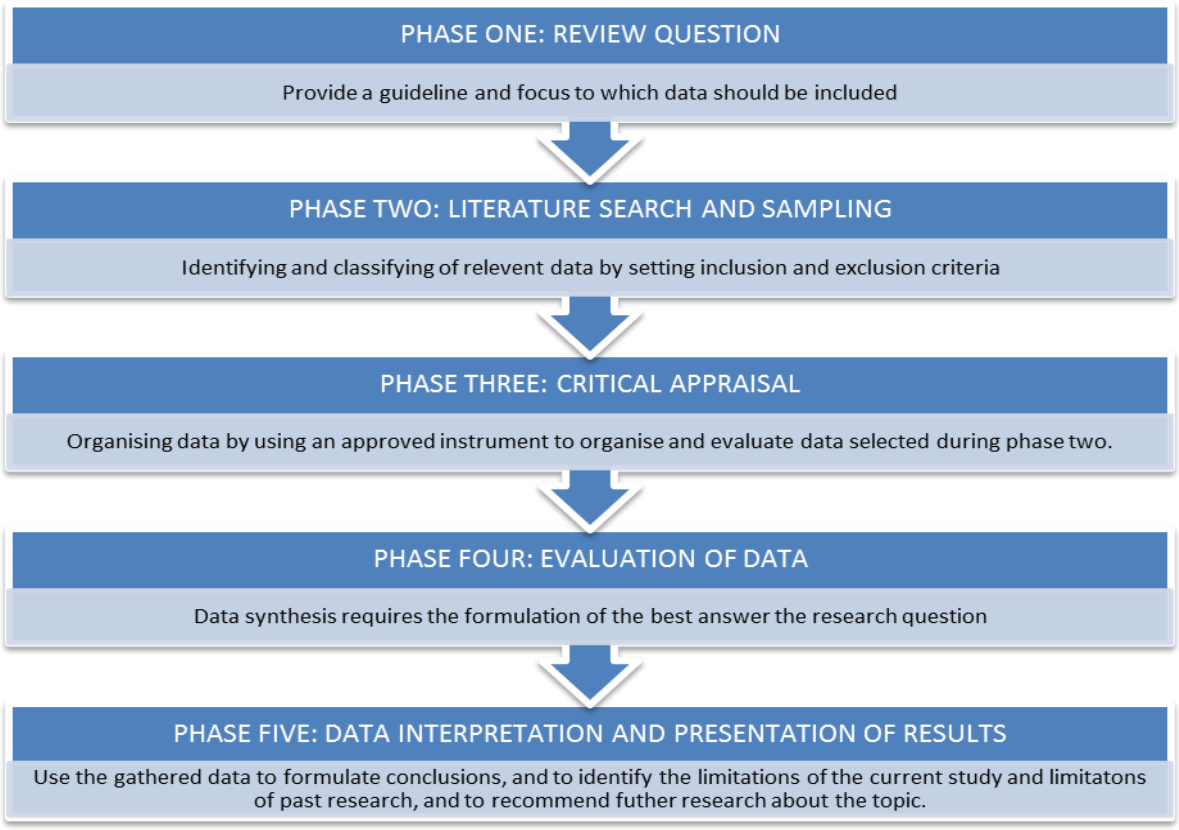

Figure 1.1: Five phases of a systematic literature review (Whittemore & Knafl, 2005:549):

The researcher considered the systematic review to be the best method to search existing data and gather information on the topic to answer the research question. Furthermore, to identify the possibility needed for further research.

1.7 RESEARCH DESIGN

An explorative, descriptive design was adopted to find an answer to the stated research question (Whittemore & Knafl, 2005a:552). An explorative design was used to obtain a better understanding of the phenomenon that was being studied (Polit & Beck, 2008:20). The choice of an explorative design was appropriate because the researcher had limited knowledge about the musical elements that could affect the physiological responses (of enhanced oxytocin and prolactin production) promoting lactation and breastfeeding outcomes.

A descriptive design refers to the critical synthesis of the preliminary data gathered, enabling the researcher to identify the best possible answers to the research question (Brink *et al.*, 2006:120; Grove *et al.*, 2014:28). Data were collected that focused on identifying the physiological challenges experienced by lactating mothers, and on the effect of music on each of these challenges (pain, hormonal imbalance, stress and anxiety). This provided a scientific background of literature to formulate a conclusion that could enhance best practice guidelines to improve lactation and breastfeeding outcomes.

1.7.1 Phase One: Review Question

The formulation of a review question focussed the research, as it directed the data search with the formulation of a specific topic and appropriate keywords. This question should be sufficiently specific to enable the search to focus on suitable data, yet care should be taken to guarantee that it was wide enough to prevent undue limitations during the search (Whittemore & Knafl, 2005a:549; Grove *et al.*, 2014:619). A systematic review question should have specific characteristics allowing the question to be searchable and answerable. These characteristics were compressed in the widely used acronym PICOT: P – population of interest, I – intervention, C – comparative interventions, O – outcomes, and T - Time (De Souza *et al.*, 2010b:102 - 106). By using the PICOT format to formulate a research question during a systematic review, it ensures that the question will be able to direct the data search to get a reliable and valid answer (Whittemore & Knafl, 2005a:549). The researcher used the PIO format adapted form PICOT format as it provided the best outcome for the study. No comparative interventions were done or explained in this study.

P – Population (population in the primary studies – breastfeeding women and breastfeeding infants)

I – Intervention needed in practice (therapeutic musical elements e.g. music that is slow and soft with a repetitive tempo)

O – Outcome (to identify and describe the elements of music to be used to improve breastfeeding outcome, to improve breastfeeding rates at six months, less breastfeeding related pain, signs of enhance production of oxytocin and prolactin, as well as improvement on the emotional state of the breastfeeding mother)

The researcher identified the following review question:

> *Which music elements will have a positive influence on the production of oxytocin and prolactin affecting human milk production and breastfeeding outcomes such as improved breastfeeding rates at six months, less breastfeeding related pain, signs of enhance production of oxytocin and prolactin, and improved emotional state of breastfeeding mother?*

1.7.2 Phase Two: Literature Search and Sampling

Phase two of a systematic review involves the development of a well-planned search protocol to limit the bias of data collected (Whittemore & Knafl, 2005a:548). The literature search and sampling were done according to the protocol, emphasising similar inclusion and exclusion criteria set for evaluating each document (Whittemore & Knafl, 2005a:549).

1.7.2.1 Literature Search

Keywords

The formulation of a list of keywords is essential for identifying relevant data to answer the research question. The development of keywords was essential for accurate data collection and for limiting bias (Grove *et al.*, 2014:620). Keywords were developed for this study primarily to obtain information for the proposed study. The importance of spelling of the keywords became apparent during this phase. Therefore the researcher used keywords that were listed in the Medical Subject Headings (MeSH) (Anon:25) deemed to enhance the credibility of the conducted study. A large number of keywords were developed as the search was data-driven. Also, different aspects of the review question needed to be addressed. Specific keywords were developed to identify mothers' breastfeeding difficulties. A different set of keywords was developed to identify data referring to musical elements impacting on the physiological

responses. This wide range of keywords enabled the search to include relevant data and to ensure that bias was limited.

The initial keywords were: breastfeeding difficulty, music therapy, physiological barriers to breastfeeding.

MeSH approved keywords (number of hits indicated in brackets) used for the research were (see **annexure A**):

- discontinue breastfeeding (186),
- breastfeeding challenges and physiological response (23),
- breastfeeding and difficulties (31),
- music therapy and breastfeeding (7),
- music and breastfeeding (7),
- music therapy and pain (67),
- music therapy and hormones (5), and
- music therapy and stress (12).

1.7.2.2 Databases used during the literature search

Different databases were used to identify relevant information by using the keywords stated in the preceding paragraph. These databases included EbscoHost, Medline, SAePublications, and Science Direct. A cross-check of data was done by using Google Scholar to ensure that no relevant documents were missed. No manual searches of hard copies in libraries were conducted as the electronic databases provided an all-inclusive platform of available relevant data.

1.7.2.3 Inclusion and Exclusion Criteria

Inclusion and exclusion criteria needed to be determined before conducting the research (Whittemore & Knafl, 2005a:548). With multiple hits from the selected keywords, the specific inclusion and exclusion criteria helped to narrow the data selection process to a small sample relevant to the review question, while avoiding bias during the gathering of information (Grove *et al.*, 2014:345). All data gathered were processed and included once the inclusion criteria were met using the systematic review method. Sources published in languages other than English were not considered for this review due to the language barrier.

Inclusion criteria:

1. Primary studies to ensure validity of data
2. Studies focussing on breastfeeding difficulties from birth.
3. Studies focussing on early cessation of breastfeeding.
4. Studies focusing on the effect of music on breastfeeding outcome.
5. Studies focusing on the effect of music on pain experienced.
6. Studies focusing on the effect of music on hormones.
7. Studies focusing on the effect of music on stress.
8. Studies focusing on the physical response experienced due to music exposure.
9. Publication between 2012 and 2017 to meet the preference of the Journal of Human Lactation to have publication of not older than 5 year, at the time when the data search was conducted.

Studies that used music as an intervention for treatment of pain, anxiety and/or stress, and effecting the hormonal balance specifically oxytocin and prolactin, were also included in the sample, as little evidence were found where the use of music had an effect on these breastfeeding related problems.

Exclusion criteria:

1. Poor quality rating after the critical appraisal was done – Johns Hopkins quality rating of C.
2. Studies using a combination of music with another form of intervention to achieve the study goals set.
3. Studies where the population of breastfeeding infants were not followed from birth.
4. Studies which include sound as an intervention, and not music.
5. Studies focusing on breastfeeding difficulties due to anatomical defects, e.g. cleft pallet, ankyloglossia, etc.
6. Studies where the content was unrelated to the research question in this dissertation.

1.7.2.4 Recording the literature search process

A complete record reflects the date of each search and the results. The entire search process was documented in the method section (Whittemore & Knafl, 2005a:548). The researcher initially used the Evidence of Policy and Practice Information (EPPI) programme to help with the gathering of data. Furthermore, to formulate statistics on the search process by providing data about the search terms, databases used search strategies and inclusion, and exclusion criteria were created to refine searches. A secondary search of excluded data was done by hand to ensure all data collected were relevant and within the time frame set in the inclusion criteria of 2012 – 2017.

The validity of the study was improved by the use of a co-coder (de Souza *et al.*, 2010a:107) (see **annexure I**) to evaluate the relevance of data included, using the appropriate inclusion and exclusion criteria as set by the researcher and previously explained.

The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) diagram was used to keep track of all completed searches (Moher *et al.*, 2009:264 - 269). This is presented in **Annexure D**.

1.7.3 Phase Three: Critical Appraisal

Critical appraisal is the evaluation of methodological rigour of the primary studies selected that met the inclusion criteria. This was the last phase of the sampling process (de Souza *et al.*, 2010a:107). By critical appraisal of studies included, the rigour and characteristics are evaluated to determine the validity and credibility of data included. The Johns Hopkins Appraisal Instrument was used to achieve this accreditation of data (see **Annexure B**) (Newhouse *et al.*, 2007:99). By using the Johns Hopkins Appraisal Instrument, the strength of each included source was evaluated. This instrument provided a platform for evaluating and appraising all data limiting the researcher's bias. A co-coder, experienced in conducting systematic reviews and using the Johns Hopkins Appraisal Instrument, independently evaluated the included data to enhance the validity of the study's findings.

The Johns Hopkins Appraisal Instrument was used to evaluate the quality of scientific evidence, namely

(i) high quality (A) with consistent results and an adequate sample size,

(ii) good quality (B) with reasonably consistent results and an adequate sample size, or

(iii) low quality (C) with significant flaws and an inadequate sample size (Newhouse *et al.*, 2007:100).

The strength of evidence is also evaluated and rated form level 1-3. The strength of evidence can be rated as follows:

- Level 1 = experimental and meta-analysis studies.
- Level 2 = quasi-experimental studies.
- Level 3 = non-experimental, qualitative and meta-synthesis studies.

See **Annexure B** for further instructions on the use of the Johns Hopkins Appraisal Instrument.

Initially, 465 studies were identified through the keyword search. The identified sources were then narrowed down by applying the inclusion and exclusion criteria (see **Annexure B**). Through this process of elimination, only 149 sources met the inclusion criteria which were prepared for critical appraisal as explained in phase three. All relevant sources are included in the list of references so that the readers can access all sources accessed by the researcher at the end of this dissertation. The sources deleted due to not meeting the CA criteria are only mentioned in the annexures and not in the text itself. The total number of studies identified for inclusion after the critical appraisal was 71. When placed into groups, the total number of studies for inclusion presented as characteristics of music (8), Breastfeeding difficulties (31), music and pain (11), music and hormones (9), and music and stress (12).

1.7.4 Phase Four: Evaluation of Data

Data gathered and analysed during the first three phases were compared to findings reported by other sources (de Souza *et al.*, 2010a). This phase was critical to identify gaps in research-related knowledge to established priorities for future studies. Gathered data were interpreted in order to answer the research question at hand. The researcher formulated conclusions from accurate data collection. All information were compared resulting in an unbiased interpretation of the literature to answer the research question best at hand (Whittemore & Knafl, 2005b:553).

Evidence-based Practice (EBP) focuses on the classification of evidence by analysing five levels:

- Level 1: evidence resulting from a meta-analysis of multiple randomised controlled clinical trials.

- Level 2: evidence from individual studies with experimental designs.
- Level 3: evidence from quasi-experimental studies.
- Level 4: evidence of descriptive (non-experimental) studies or with a qualitative approach.
- Level 5: evidence from case reports or experience (de Souza *et al.*, 2010a:107).

1.7.5 Phase Five: Data Interpretation and Presentation of Results

Data gathered and analysed from the previous phases were combined to form a data synthesis (De Souza *et al.*, 2010b:107). Meta-analysis of included data was impossible, as the study included sources comprising both quantitative and qualitative research designs. Consequently, a thematic analysis was used as repeated and central themes in the studies formed the themes (Dixon-Woods *et al.*, 2005:48). The combination of themes provided the platform for the interpretation of the data and to answer the research question.

The identified themes were: breastfeeding difficulties; music uses to reduce pain, music uses to reduce stress, music used to improve hormonal imbalance.

These findings are presented in Annexure H as the final synthesis of data gathered using the systematic review method to describe the research phenomenon. This was done in order to answer the research question.

1.8 RIGOUR

Rigorous (trustworthy) research aims to establish brilliance through research that is transparent and explicit (Grove *et al.*, 2014:105). The researcher used five principles to achieve rigour: credibility, applicability, consistency, neutrality, authenticity (Krefting, 1991:218; Guba & Lincoln, 1994:105; Whittemore & Knafl, 2005a:548; Grove *et al.*, 2014:54).

Credibility or truth value refers to the confidence or belief in the presented results (Guba & Lincoln, 1994:105). Objectivity is required during the data collection and interpretation phases of the study to present the actual findings of each reviewed document (De Souza *et al.*, 2010b:105). To enhance the credibility of data collected for this study, only primary research reports were included. An audit trail was kept throughout the sampling process and analysis phases (Krefting, 1991:218). The researcher used the **PRISMA flowchart (see Annexure C)** and the EPPI-reviewer program. This provided proof of data saturation, and a reference to past searches (Krefting, 1991:219; Whittemore & Knafl, 2005a:548).

Applicability or generalizability of the research results refers to the use of these findings in other contexts or settings, or for further research (Grove *et al.*, 2014:54). The elements of music that could enhance lactation and breastfeeding outcomes, through producing positive influences on physiological parameters (the production of oxytocin and prolactin enhancing human milk production), had been identified and extracted in this systematic review. This provided a literature background for the formulation of suggestions towards a therapeutic music programme comprising music elements that breastfeeding women could use at home to improve breastfeeding outcomes.

Consistency or dependability determines the trustworthiness of the study's findings. Consistency requires that the results would be similar if the research should be repeated in a comparable setting (Krefting, 1991:216). In this study, consistency was established by using keywords to identify relevant sources (data) included. The method of sampling, analysis of data and the interpretation thereof had been described in detail to provide an audit trail of how the study was conducted.

Neutrality or conformability is the interpretation of the results in an unbiased manner. To accomplish this, the researcher had set aside personal assumptions and only reported on data gathered. This implies that all data that had been collected must be free from the researcher's perspectives, beliefs, religious and other assumptions (Krefting, 1991:216; Grove *et al.*, 2014:374). The researcher used a co-reviewer, experienced in conducting systematic reviews, who independently examined all selected data. The researcher and the co-coder reached consensus on the level of evidence of data included in the current systematic review.

Authenticity ensures rigour or trustworthiness of the study (Krefting, 1991:217). All data sources included in the current study were subjected to the same sampling process and were evaluated to determine the quality and level of evidence.

1.9 ETHICAL CONSIDERATIONS

Ethical considerations in nursing research are essential for providing the foundation for evidence-based practice (Grove *et al.*, 2014:159-191). Ethical considerations implied the following research elements:

- the research was truthful, and that inaccuracy of results avoided,
- the research-maintained values fundamental to collaborative work, like trust, mutual respect, and fairness,
- the accountability for a research project's outcomes was specified,

- public support was encouraged throughout the research process, where the values and truthfulness could be trusted, and
- moral and social standards were improved (Resnik, 2011:1).

The researcher complied with ethical considerations during the current study. Although the study did not involve human participants, the researcher had an obligation to conduct ethical and honest research (Grove *et al.*, 2014:159-191). INSINQ School of Nursing Science Research Committee. Throughout the study the researcher adhered to specific principles of ethics as described by the North-West University, Potchefstroom campus and by the Medical Research Council (MRC, 2003:12; NWU, 2016:26).

To comply with the ethical considerations, the researcher evaluated each article included in the sample according to (i) the author's credibility, (ii) the consent provided by the participants, (iii) a positive benefit-risk assessment (Vergnes *et al.*, 2010:772), and (iv) accurate interpretation and presentation of results and studies using suitable and rigorous methods. The research included in this review had been evaluated by using the Johns Hopkins Appraisal Instrument for Research (**Annexure B**).

The researcher ensured that all included data had been obtained ethically (Wager & Wiffen, 2011:130) by adhering to the following principles:

- **Avoiding redundant publications:** No duplications of secondary research had been included in this review.
- **Avoiding plagiarism:** Accurate referencing was done according to the NWU's Harvard Style throughout the dissertation, except for the different referencing style required by the specific journal for the article presented in chapter 3.
- **Transparency:** No funding that could influence the findings of this study was received during the period of this study, and no research bias was experienced in any manner.
- **Conflict of interest:** The researcher did not receive funds from any person, institution or agency to conduct this study. The outcomes of the study are based solely on the findings that emerged during the systematic literature review.
- **Accurate data extraction:** To ensure data extraction was accurate, the researcher used a tool developed for data extraction (see Annexure D). A co-reviewer was used to reach consensus on the relevance and value of specific findings reported in sources included in this study.

1.10 DISSERTATION LAYOUT

This dissertation report is presented in article format according to the NWU guidelines.

Chapter 1	**Overview of the study.**
Chapter 2	Literature study: Literature background on breastfeeding challenges and the physiological effect of music.
Chapter 3	**Article** Title: Music elements impacting on physiological responses in lactating mothers: A Systematic review. The article will be submitted to the *Journal of Human Lactation.*
Chapter 4	Conclusions, limitations, and recommendations.

1.11 SUMMARY

In this chapter, the literature background has been discussed that lead to the formulation of a problem statement and research question. The preliminary literature search led to the identification of the assumptions underlying the current study and the formulation of the aim and objectives. The research design and method were chosen as the most effective way of conducting the systemic review of literature available on the topic. This provided an outline for the research process. The next chapter will present the literature reviewed about physiological factors that can influence lactation and breastfeeding outcomes. Also, the literature relevant to music elements that could impact on the physiological lactation process and breastfeeding outcomes.

CHAPTER 2
LITERATURE REVIEW

2.1 INTRODUCTION

This chapter aims to provide a scientific background of literature substantiating the systematic review conducted during the current study. A broader narrative literature review is performed to explore current literature on the topic, provide additional background literature for the systematic review, and to guide the formulation of the research question. The review question further guide the inclusion of relevant data into the sampling pool of the study conducted. The review question is formulated as follows:

> *Which music elements will have a positive influence on the production of oxytocin and prolactin affecting human milk production and breastfeeding outcomes such as improved breastfeeding rates at six months, less breastfeeding related pain, signs of enhance production of oxytocin and prolactin, and improved emotional state of breastfeeding mother?*

This question require that different aspects of literature needs to be described to answer the research question. Therefore, the literature background consists of breastfeeding literature stating all legislation, benefits of breast milk to the mother and infant, the physiology of breastfeeding and the physiological challenges as experienced by breastfeeding mothers. These challenges were identified, namely (i) pain, either related to the birthing process or due to breastfeeding, (ii) hormonal imbalance leading to insufficient oxytocin and prolactin levels resulting in decreased human milk production and (iii) stress and anxiety which could suppress human milk production.

Although breastfeeding legislation did not form part of the review question and data explored for this review, it was presented in the background to demonstrate the importance of breastfeeding. The focus was on a country like South Africa were EBF rates were as low as 11.9% at the age of three months, and 1.5% at the age of six months (Du Plessis, 2016:122).

2.2 BREASTFEEDING LEGISLATION IN SOUTH AFRICA

The World Health Organization (WHO), in collaboration with the United Nations Children's Emergency Fund (UNICEF), strived to improve global breastfeeding rates by making recommendations regarding breastfeeding and the duration thereof (WHO, 2014:3). These organisations emphasise the importance of breastfeeding and human milk to newborn infants,

aiming to reduce the mortality rate of children younger than five years. Exclusive breastfeeding (EBF) was recommended for the first six months of the infant's life (WHO, 2016:2-3). The WHO and UNICEF defined EBF as infant feeding comprising only human milk, without any additional liquids or solids, except oral rehydration solution, drops/syrup of vitamins, minerals or medicines for the first six months of the infant's life (UNICEF, 2011:40).

Breastfeeding in South-Africa has an introductory rate at birth of 88% (Du Plessis, 2016:122), but decreases drastically during follow-up visits at clinics to 8–22% of infants being EBF at six months of age (Mhlanga, 2008:133; Du Plessis, 2016:122). EBF rates were low as infants were given mixed feeding (human milk mixed with supplemental formula feeds and solids), or early cessation of breastfeeding before the infant reaches the ages of six months (Du Plessis, 2016:4 - 5). Difficulties experienced by breastfeeding mothers could contribute to these low rates of EBF in South Africa. The South African government recognised and addressed this problem by developing the Tshwane Declaration for the Support of Breastfeeding in South Africa (Du Plessis, 2016:4 - 5). This declaration emphasised the importance of breastfeeding, and specifically of EBF until the infant reaches six months of age. To achieve this, and to adhere to international standards, the Tshwane Declaration stated that no free infant formula would be issued at any public facility, except with a well-motivated prescription by a health care provider (DOH, 2011:214 - 216).

A need existed for different methods to increase breastfeeding rates, to meet the goals set by the WHO and UNICEF to increase breastfeeding rates to 50%, and to reduce the mortality rate of children under five years of age by 2025 (UNICEF, 2015:1).

The WHO guidelines indicated the importance for HIV-positive mothers to continue breastfeeding their infants until they were 12 months old. These infants could be breastfed for 24 months with a minimum risk of contracting HIV when the mothers were on ARVs. As from the age of six months, solid foods should be introduced systematically (WHO, 2016:4). The longer an infant received human milk, the lower the mortality rate was (Ogundele & Coulter, 2013:1).

2.3 LACTATION PHYSIOLOGY: HORMONAL BALANCE AND HUMAN MILK EJECTION

The production of human milk depends on a complex physiological process with an interaction of lactation hormones. This hormonal proses that are required during the production of human milk are referred to as "Lactogenic hormone complex" (Lawrence & Lawrence, 2015:56). It consisted of the hormones progesterone, oestrogen, prolactin and metabolic hormones (Kent,

2007:564; Walshaw, 2010:1929). The hormones responsible for the production of breast milk can be divided into two groups, namely:

(i) reproductive hormones (progesterone, oestrogen, placental lactogen, prolactin, oxytocin), and

(ii) metabolic hormones (glucocorticoids, insulin, growth and thyroid) (Kent, 2007:568).

The reproductive hormones had a direct influence on the synthesis of human milk whereas the metabolic hormones had an indirect influence on the milk production (Walshaw, 2010:1292; Lawrence & Lawrence, 2015:60).

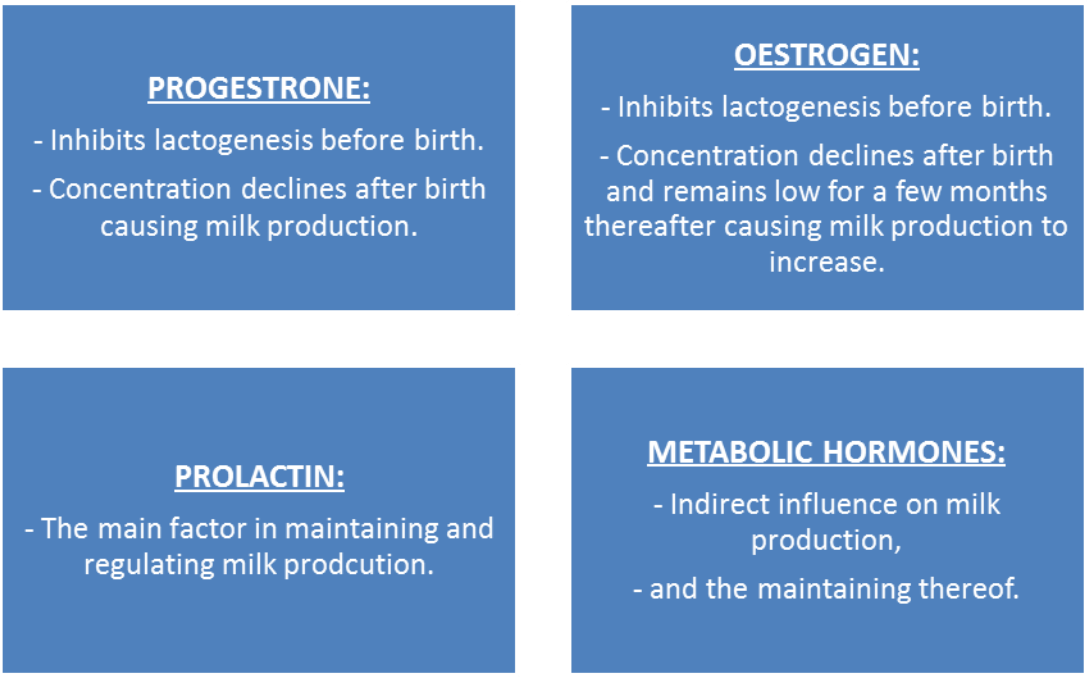

Figure 2.1: Lactogenic hormone complex as compiled by the literature

Human milk is initiated in the following two stages (Lawrence & Lawrence, 2015:56 - 57):

1. Secretory differentiation, and

2. Secretory activation.

The secretory differentiation is also referred to as *lactogenesis I* and mainly starts during the third trimester of pregnancy to three to four days post-partum (Keith *et al.*, 2012:113). The milk produced during the secretory differentiation is called *colostrum* and is characterised by having all the nutrients required by the infant during the first days of infant life (Tudehope, 2013:18).

The nutrient basis of colostrum is a combination of high concentration of proteins, fat-soluble vitamins, minerals and immunoglobins (an antibody that is involved in the immune function of the mucous membranes) (Walshaw, 2010:1292). Human milk production in this stage does not require the tactical stimulation of the infant suckling on the breast, but is the result of the hormonal effect during the last trimester of pregnancy and the birthing process (Keith *et al.*, 2012:113). This results in a spontaneous flow of human milk even before any tactical stimulation has taken place.

During the secretory activation stage, the expulsion of the placenta during birth triggers a hormonal reaction where the concentration levels of the hormones oestrogen and progesterone are lowered (Kent, 2007:564 - 570). This differentiation in hormonal levels directly after birth results in human milk ejaculation. An increase in blood flow with an increase in the uptake of oxygen and glucose occurs, with a significant increase in citrate concentration can be seen as reliable markers indicating the start of stage II of human milk production, also referred to as *lactogenesis II* (Kent, 2007:567; Lawrence & Lawrence, 2015:57). Stage II usually begins during day three to four after delivery when the milk secretion is copious, and the plasma α–lactalbumin concentration is at the highest. This period is referred to in plain language as “the period when the milk comes in”. The human milk produced during this phase is called transitional milk, and have a different composition than colostrum. It takes up to ten days for the composition of human milk to develop from transitional milk to mature milk. The creation of matured human milk are called stage III of lactogenesis, previously referred to as the galactopoietic phase (Lawrence & Lawrence, 2015:58 - 67).

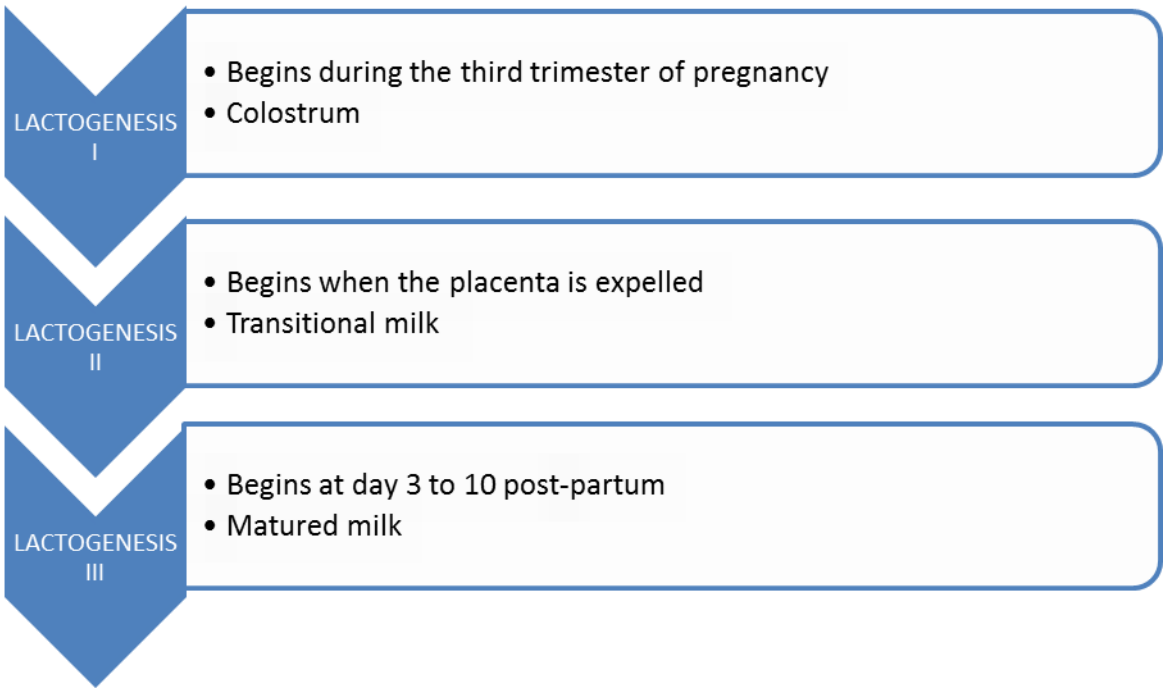

Figure 2.2: Three stages of breast milk production

Tactile stimulation of the breasts increases prolactin receptors, and therefore increase the production of human milk (Kent, 2007:567 - 568). This tactile stimulation can either be by the infant suckling on the breast or by milk expression manually (Brownell *et al.*, 2012:608) and is a neuro-endocrine process (Walshaw, 2010:1294). During this process, nervous impulses are triggered and transported from the nipple to the magnocellular oxytocin neurons in the hypothalamus resulting in the production of oxytocin in milk ejection.

The synthesis of oxytocin is stimulated through pulses in the systematic circulation in the breast (Walshaw, 2010:1294). The release of oxytocin activates the contraction of the smooth muscles in the body and as a result the alveoli in the breast contract resulting in the ejection of breast milk (Brownell *et al.*, 2012:609). The higher the oxytocin concentration is, the more effective the triggered ejection response will be (Walshaw, 2010:1295). (Brownell *et al.*, 2012:609).

2.4 MAIN REASONS FOR THE CESSATION OF BREASTFEEDING

The ideal period of exclusive breastfeeding is six months (WHO, 2014:3 - 4). Most new mothers intent to breastfeed for six months. Through research, it became evident that only 32% of all infants were still breastfed by the age of 3 months (Neifert & Bunik, 2013:117). These statistics were less encouraging in South Africa were only 6% of infants were exclusively breastfed by the age of six months in 2014 (Goosen *et al.*, 2014:16). Many reasons were cited for this very low complying statistic of EBF. Three main categories came to light as possibly being the reason for earlier than the desirable cessation of breastfeeding, namely physical, lactation and emotional factors. These categories were developed by the researcher.

Table 2.1: Most common reasons for the early cessation of breastfeeding

Reason for the cessation of breastfeeding	Supportive data	Percentage of discontinuation before six months of infant life
Physical factor presented as pain experienced by the nursing mother	Six studies (McClellan *et al.*, 2012:518; Brown & Jordan, 2013:809; Neifert & Bunik, 2013:116; Odom *et al.*, 2013:e729; Tully & Ball, 2014:716; Hobbs *et al.*, 2016:6) indicated that pain experienced by the breastfeeding mother, either from the	62% (pain related to the mode of delivering). 23% (pain related to breastfeeding).

Reason for the cessation of breastfeeding	Supportive data	Percentage of discontinuation before six months of infant life
	mode of delivery or experienced as breastfeeding related pain.	
Lactation factor	Eight studies (Hurst, 2007:588; Walshaw, 2010:1293; Aluka-Arowolo & Adekoya, 2012:2; Brownell *et al.*, 2012:609; Dashti *et al.*, 2014:712; Robert *et al.*, 2014:6; Kair & Colaizy, 2016:252; Procelli, 2016:4) cited lactation factors as a reason for earlier than the desirable cessation of breastfeeding. This could be categorised as perceived insufficient milk (PIM) supply and delayed lactogenesis II (DLII).	50% (PIM) 15% (DLII)
Emotional factor as seen in stress and anxiety experienced by the nursing mother	Nine studies (Brown & Jordan, 2013:273; Debes *et al.*, 2013:7; Dennis *et al.*, 2013:76; Figueiredo *et al.*, 2013:332; Fox *et al.*, 2015:11; Keely *et al.*, 2015:532; Chaplin *et al.*, 2016:144; Chaput *et al.*, 2016:e103; Kossakowska, 2016:10) cited emotional factors as the reason for cessation where stress and anxiety were experienced by the nursing mother.	8%

2.4.1 Physiological factor

The cessation of breastfeeding was attributed to difficulties caused by physical pain and the adverse effect of analgesics on the lactogenic hormone complex, ultimately having a negative impact on the lactating process (Brown & Jordan, 2013:809; Odom *et al.*, 2013:e729; Tully & Ball, 2014:716). Through research, it became evident that nursing mothers who discontinued breastfeeding during the first week after delivery, cited physical pain and painful, cracked

nipples. This was caused by difficult breastfeeding due to physical pain experienced (McClellan *et al.*, 2012:518). The experience of physical pain was directly linked to the following situations:

- pain caused by the birthing process,
- where a traumatic birth was experienced, either with an assisted vaginal delivery or by a caesarean section, and
- pain experienced through cracked and painful nipples (Brown & Jordan, 2013:809; Neifert & Bunik, 2013:116; Hobbs *et al.*, 2016:6).

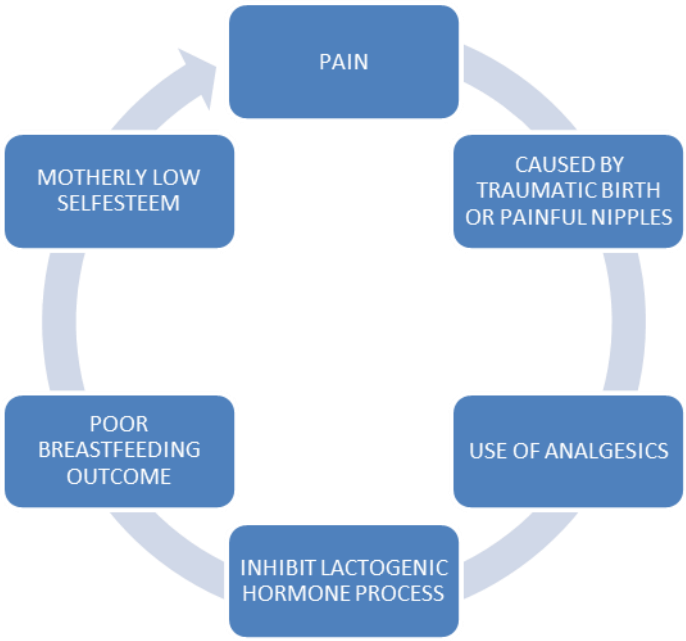

Fig 2.3: Negative impact of pain on breastfeeding outcome as compiled by literature

2.4.2 Hormones

Problems with the hormones can lead to perceived Insufficient Milk (PIM) supply could be a reason for the cessation of breastfeeding. Women with inadequate information about breastfeeding and those who were educationally disadvantaged were more likely to name PIM as a reason for early cessation of breastfeeding (Robert *et al.*, 2014:6). Delayed lactogenesis II (DL II) occurred when the period between the production of colostrum (lactogenesis I) and the establishment of mature milk (lactogenesis III) was extended (Hurst, 2007:588). Delayed lactogenesis II leads to inadequate milk supply. Considering that these reasons for discontinuation of breastfeeding were linked to hormonal influences on breastfeeding, one can assume that the negative impact on the hormonal production could result in difficulties with milk

production and ejection processes (Walshaw, 2010:1293; Brownell *et al.*, 2012:609). The overall outcome of breastfeeding depended on the success of feeding during the first weeks after delivery. Problems that were experienced during this period led to the early cessation of breastfeeding and could explain the cessation rate of 50% of breastfeeding mothers during this time (Procelli, 2005:4).

With the exploration of literature, specific musical elements were presented as being beneficial to support breastfeeding. These musical elements address the problems experienced by the lactating mother.

2.5 MUSIC THERAPY

Based on the literature reviewed, it became evident that a distinction should be made between *music therapy* and the *therapeutic use of music* (or *music medicine* as some authors prefer to use the latter term). Music therapy is the administration of music for healing purposes by a trained and certified music therapist (Nilsson, 2008:780). Therapeutic music or music medicine referred to “passive listening to pre-recorded music” which could be administrated by any person with a relationship to the patient (Bradt & Dileo, 2009:6). For this literature review, the uses of music as a therapeutic medium were explored. Several studies investigating the effect of music on the human body reported inconsistent results. However, when the parameters used by the researchers were individualised, improved correlations were obtained. By describing research results related to the effect of music interventions on the physiological responses affecting lactation and breastfeeding, it became apparent that music could play a role in improving lactation.

Controversy exists on the most effective music to use as a therapeutic medium. Some authors claimed that self-selected music had a higher value (Walworth, 2010:338; Crawford *et al.*, 2013:224 - 229; Jiang *et al.*, 2013:201 - 205). However, another study suggested that the tempo of the music was more important for experiencing a relaxing effect, than the music style or personal preference (Bernardi *et al.*, 2006:450 - 451). Musical elements with value to the user were cited in the reviewed literature as:

i. Tempo: slower or meditative music with a consistent beat of 60-80 per minute that mimics the heartbeat, with repetitions (Bernardi *et al.*, 2006:445; Walworth, 2010:337; Tan *et al.*, 2012:150). The idea was to replicate the beat or tempo of the human heart (Lai *et al.*, 2006:140).

ii. Melodic structure: absence of strong rhythms, repetitive and simple tunes. This music reduces anxiety experienced by the listener (Bhana & Botha, 2014:7).

iii. Music dynamic: soft and quiet music, with predictable aspects, meditative music decreases the heart rate, respiration and blood pressure of the listener (Bernardi *et al.*, 2006:447; Tan *et al.*, 2012:151). Music with this dynamic lower the stress response and pain experience of the listener (Crawford *et al.*, 2013:225).

iv. Music character: the absence of voice and lyrics were significant, piano music or string instruments were suggested and resulted in less pain and anxiety experienced (Walworth, 2010:336; Tan *et al.*, 2012:177; Crawford *et al.*, 2013:229).

The effect of music on the physiological lactation processes will be discussed in sections 2.5.1 and 2.5.3.

2.5.1 The influence of music on pain

One of the main difficulties experienced during breastfeeding is pain experienced by the lactating women. This pain can be attributed to physical and psychological experiences of the lactating women (Ebneshahidi & Mohseni, 2008:370 - 383; Engwall & Duppils, 2009:371 - 383). Also, pain experienced during and after the baby's birth and pain resulting from breastfeeding like painful and cracked nipples (Karlström *et al.*, 2007:434). While the use of analgesics and opioids can relieve pain, the impact on breastfeeding and bonding could be detrimental. By using analgesics and opioids, the mother-infant bonding process might be compromised by delaying mother-infant contact. Furthermore, the mother's ability to care for the infant directly after delivery could be limited due to the side-effects of analgesics like sleepiness and suppressed lactation hormones (Ebneshahidi & Mohseni, 2008:830; Engwall & Duppils, 2009:370 - 383; Bernatzky *et al.*, 2011:1989). Pain control is essential for ensuring successful breastfeeding.

Exposure to music after caesarean sections was reportedly associated with decreased postoperative pain experiences (Engwall & Duppils, 2009:370). The auditory pathway has an inhibiting effect on the pathway of pain. This interaction between these pathways prevented the nociceptive stimuli of the central nervous system transmission (Şen *et al.*, 2009:111). This mechanism resulted in a similar decrease in pain experienced as when opioids are administrated (Şen *et al.*, 2009:224 - 226) and acted as an N-methyl-D-aspartate receptor (NMDA) antagonist. A lowering in the blood pressure and heart rate were also reported when exposed to the therapeutic uses of music. The significance of this physiological effect implied that when music is used therapeutically, women experienced less pain after caesarean sections and required fewer analgesics (Ebneshahidi & Mohseni, 2008:827; Engwall & Duppils, 2009:371; Şen *et al.*, 2009:112).

2.5.2 Music and hormonal balance (oxytocin and prolactin) affecting human milk production and ejection

Oxytocin and prolactin hormones are directly linked to breastfeeding and breast milk production. Women who used therapeutic methods of music listening reportedly had higher concentrations of these hormones than lactating mothers who were not exposed to music interventions (Nilsson, 2009:201 - 207).

While it became evident that stress and anxiety might have a decreasing effect on the concentration of oxytocin and prolactin, the effective treatment of stress and anxiety will have an increasing effect on these hormones. Thus, breast milk production and breastfeeding outcomes are improved. (Colliver, 2015:12 - 13).

2.5.3 The impact of music on stress and anxiety

Stress and anxiety can be an underlying cause of physical and psychological diseases, specifically when exposed to excessive stress or anxiety (Elliot *et al.*, 2011:265). Lactating mothers experience different levels of stress and anxiety during their breastfeeding journey (Jayamala *et al.*, 2015:1 - 4) which may have a negative influence on the production of human milk (Lai *et al.*, 2006:139). Lactating mothers who experienced anxiety led to a hormonal imbalance in the body where there was a lowering in the concentration of oxytocin and prolactin levels (Colliver, 2015:12 - 13). This in return resulted in a lowering of human milk production.

A positive correlation existed between the lowering of stress levels and increased breast milk production (Jayamala *et al.*, 2015:1 - 4). When exposed to the relaxing effect of music, the salivary cortisol levels in lactating women were lower. As a result, women reportedly felt more relaxed and less anxious (Lai *et al.*, 2006:145; Jayamala *et al.*, 2015:2). When exposed to therapeutic music listening over a two week period, a reduction in stress and anxiety, and depression were reported (Cervellin & Lippi, 2011:371). When listening to music, a relaxation response was triggered (Zanardo *et al.*, 2011:321 - 323) which lowered cortisol levels, implying reduced stress levels (Nilsson, 2009:2159). Thus, when exposed to music listening with specific elements (soft, slow music with 60-80 beats per minute, no vocals preferably using pianos or string instruments), a lower heart rate, respiration, and blood pressure were noted (Leardi *et al.*, 2007:943 - 947; Nilsson, 2009:206 - 207).

Chapter two provided background information with the main focus on separate aspects of reasons for failure to EBF and the influence of music. Further research need to be done to determine how specific music with defined elements, does influence the lactating mother's

physiological functioning in such a manner that breastfeeding problems and difficulties will improve when listening to this specific music.

2.6 SUMMARY

Breastfeeding difficulties could lead to earlier than the desirable cessation of breastfeeding, before the infant reaches six months of age, or even before the infant reaches six weeks of age. Improving breastfeeding outcomes and overcoming identified breastfeeding challenges remain problematic. During the exploration of data, music was identified as a potential cost-effective intervention (at home) to address some of these challenges and to improve breastfeeding outcomes.

The use of therapeutic music with elements of a slow, repetitive tempo replicating the heartbeat of a person, which is soft without any voices, using preferably piano or string instruments, could have benefits for enhanced lactation and breastfeeding outcomes. By stimulating a calming effect, stress and anxiety were reportedly lower, the hormonal interactions responsible for lactation were positively stimulated resulting in improved breast milk production and ejection, and providing a cost-effective way of pain control through the use of music therapy. Thus, the use of specific musical elements could enhance milk production and ejection with positive influences on lactation and breastfeeding outcomes.

The main focus of this chapter was to provide literature background to understand the research question, namely “which musical elements could positively influence physiological responses, with specific reference to physical, hormonal and emotional factors, in the lactating woman to enhance lactation and breastfeeding outcomes?” and to identify the best keywords to improve the literature search conducted. Through a thorough review of available research and articles, relevant sources were identified that could provide insight into and understanding of the potential impact of specific musical elements on the lactation process and breastfeeding outcomes.

Chapter three present the study conducted to answer the research question using the integrated literature review method, using the keywords derived from this chapter as background.

CHAPTER 3
ARTICLE

INTRODUCTION

Chapter 3 presents the results obtained from conducting the systematic review in an article format. The article has been written according to the author guidelines of *The Journal of Human Lactation* (presented in **annexure G**). According to the guidelines, references must adhere to the APA format. The writing style must be similar to that of the American Medical Association Manual Style. As the article has not yet been submitted for publication, no permission was required from the relevant journal for including the article in this thesis. Such information will be requested when the article is submitted to the journal. Furthermore, the dissertation will not be uploaded on the NWU repository until the manuscript has been accepted for publication to ensure that a false plagiarism report is not obtained. According to the author guidelines, no page number or header is required and are used for this dissertation only.

The use of the following terms was adopted in the context of this journal article:

- Human milk rather than breast milk.
- Milk ejection rather than milk let-down.
- Breastfeeding to be used as one word.

The journal gave a specific word count to which the researcher had to adhere:

Abstract:	239 words (250 according to guidelines)
Article:	2 996 words (4 000 words, excluding the abstract, figures, tables and the list of references)

For further author guidelines of the Journal of Human lactation, please see **Annexure G**.

Music interventions addressing selected physiological breastfeeding challenges: a systematic literature review

Ms MM Kohn (BCur) North-West University, School of Nursing Science/NuMIQ

North-West University, Potchefstroom campus

Prof Welma Lubbe (PhD; MTech; RN; Adv M, NE)

Associate Professor North-West University, School of Nursing Science/ NuMIQ

North-West University, Potchefstroom campus, 11 Hoffman Street, Building F7b,

Tel: +27 (0) 18 299 1838

Fax: +27 (0) 18 299 1927

Email: Welma.Lubbe@nwu.ac.za

Dr Antoinette du Preez (PhD; MCur; RN; Adv.M; NE)

Senior Lecturer: Midwifery

North-West University, School of Nursing Science/ NuMIQ

Tel: +27 (0) 18 299 1838

Fax: +27 (0) 18 299 1927

Email: Antionette.DuPreez@nwu.ac.za

Corresponding author: Prof Welma Lubbe

Email: Welma.Lubbe@nwu.ac.za

ABSTRACT

Background: Physiological challenges in breastfeeding can cause early breastfeeding cessation. The aim of this study was to explore the elements in therapeutic music that could influence physiological responses in the lactating mother to enhance the breastfeeding outcome in a cost-effective method to improve overall breastfeeding outcome.

Research aim/objectives: This study attempted to identify breastfeeding challenges associated with physiological breastfeeding responses. Furthermore, to identify specific elements of therapeutic music that could enhance physiological breastfeeding responses.

Method: A systematic review of relevant literature was conducted, and empirical research findings were synthesised to meet the study objectives. Six steps were followed, namely (i) formulating a review question, (ii) literature search and sampling, (iii) critical analyses of data gathered, (iv) evaluation of data, (v) interpretation of data, and (vi) presentation of the results.

Results: Elements of music that improve physiological responses in lactating mothers were identified as a slower tempo of 60-80 beats per minute, mimicking the heartbeat, with music that is repetitive, simple, and soft; without voices, preferably using pianos or string instruments. The benefit of therapeutic music possessing the elements can be seen in lactating women in a lowering of salivary cortisol levels, indicating less anxiety, and increasing of human milk production. Listening to music composing of these elements has the same effect than using analgesia as the auditory and pain pathway are similar.

Conclusion: With the therapeutic use of music, lactations, and breastfeeding outcomes could be enhanced using a cost-effective strategy implemented at home.

KEY MESSAGE

- Early cessation of breastfeeding are directly linked to three categories: physical, hormonal and emotional factors.
- Scientific information underlying the beneficial uses of therapeutic music has been widely published, but its application to enhance lactation and breastfeeding outcomes still needs to be studied.
- This study provide evidence that the use of therapeutic music can enhance the breastfeeding outcome when lactating women are exposed to the use thereof.
- Further studies need to be conducted to formulate a scientific program lactating mothers can use at home, containing musical elements identified through this study, to enhance breastfeeding outcomes.

MANUSCRIPT

BACKGROUND

Exclusive breastfeeding (EBF) till six months of infant life are decreasing drastically in South-Africa, with only 22 % of infants reported to have EBF (Du Plessis, 2016:4 - 5) and only 6 % thereof have been EBF for six months of infant age (Goosen *et al.*, 2014:14). Many reasons were reported to contribute to this decrease, and breastfeeding difficulty cited as the main reason for disconsolation prior to six months of infant life (Du Plessis & Pereira, 2013:127). Policies were developed in South-Africa to address this issue, and the Tshwane Declaration of support for breastfeeding in South Africa were developed (Du Plessis & Pereira, 2013:120). This declaration stated that no free formula milk would be issued by any public facility, except with a prescription by a qualified health professional (Du Plessis & Pereira, 2013:121). The Tshwane Declaration were formulated to be in line with the Millennium Developmental Goals (MDGs) that aimed to decrease child mortality by 2015. However, this goal was not reached, and the MDGs were replaced in 2016 by the Sustainable Developmental Goals (SDGs) (WHO, 2016:6). In line with these global health aims, organisations like WHO and UNICEF implemented policies to promote and protect EBF during the first six months of infant life. According to these organisations, EBF implied that an infant received breast milk only, with no other liquids or solids given, except oral rehydration solution, drops/syrup of vitamins, minerals or medications. It was advised that EBF continue for six months (WHO, 2016:5 - 6).

Breastfeeding success depends on the experience of the nursing mother during the first few days post-partum (Hall *et al.*, 2014:259). According to research the reasons for early cessation of breastfeeding were either physical, lactation (hormonal), or emotional factors (Aluka-Arowolo & Adekoya, 2012:4671; Odom *et al.*, 2013:e729). Physical factors that have a negative impact on breastfeeding can be described as pain experienced by the lactating mother, where the pain was attributed to painful and cracked nipples or physical pain due to the birthing process – either

difficult normal delivery or caesarean section (McClellan *et al.*, 2012:518; Brown & Jordan, 2013:809; Neifert & Bunik, 2013:116; Hobbs *et al.*, 2016:6). Hormonal factors experienced by lactating mothers are having an adverse impact on the lactating hormonal production. The results are insufficient milk supply and difficulties in the milk ejection processes (Brownell *et al.*, 2012:609; Robert *et al.*, 2014:6). The consequence of the inadequate production of the lactogenic hormonal complex was seen in the difficulty in the production of human milk (Brownell *et al.*, 2012:609; Robert *et al.*, 2014:6). The hormones responsible for the production of breast milk could be divided into two groups, namely:

i. reproductive hormones (progesterone, oestrogen, placental lactogen, prolactin, oxytocin), and

ii. metabolic hormones (glucocorticoids, insulin, growth and thyroid). .

The reproductive hormones have a direct influence on the synthesis of human milk, whereas the metabolic hormones had an indirect influence on the milk production (Lawrence & Lawrence, 2015:60).

Emotional challenges can be experienced as stress and anxiety by the breastfeeding woman, which can cause underlying physical and psychological diseases (Jayamala *et al.*, 2015:3). This had an adverse impact on the lactogenic hormonal complex production. Thus, a lower than normal concentration of the hormones, especially oxytocin and prolactin, results in inadequate human milk production (Colliver, 2015:12).

A need arises for a cost-effective method to address these challenges, which can be used by breastfeeding mothers to improve the outcome of breastfeeding rates. Through research available, it became evident that the use of therapeutic music might have a positive effect on the physical, hormonal, and emotional challenges experienced. Therefore, it might increase the production of human milk supply, leading to increased breastfeeding rates.

The question arose as to what music to use to enhance the breastfeeding rates, and which specific elements of the music could influence the physical, hormonal and emotional challenges experienced.

AIMS AND OBJECTIVE

The research aimed to explore therapeutic musical elements that could influence the physiological responses presenting as physical, hormonal and emotional factors in the lactating woman with the aim to improve breastfeeding outcome. The musical elements identified should have a positive impact on pain experience, hormonal imbalance and anxiety levels experience by lactating women.

The objective was to identify specific musical elements that could enhance the physiological responses related to lactation outcomes that were identified as ineffective physiological responses in lactating women, where the physiological responses refer to physical, hormonal and/or emotional challenges.

METHOD

Design

A systematic explorative review (SR) was conducted to identify the best available evidence concerning the research phenomenon, namely which musical elements could positively influence physiological responses, with specific reference to physical, hormonal and emotional factors in the breastfeeding woman, to enhance breastfeeding and lactation outcome.

Data sources were identified and appraised using the John's Hopkins Appraisal Instrument for Research (Newhouse *et al.*, 2007:100) to evaluate the relevance of the data to the question asked (Magarey, 2001:376). Also, to enable data synthesis to be completed (Whittemore & Knafl, 2005a:547). A systematic process was followed in this research, which utilized the five phases of a systematic review as described by Whittemore & Knafl. These phases included:

1. Developing a review question.

2. Literature search and sampling.

3. Critical appraisal of data included.

4. Evaluation of data.

5. Data interpretation and presentation of results.

The researcher considered the systematic review to be the best method to search existing data and gather information on the topic to answer the research question. Furthermore, to identify the possible need for further research. A systematic review (SR) method was used to critically synthesise all available evidence on the topic of musical elements to address breastfeeding difficulties. This type of review was chosen as the literature included were exclusively from research studies. No other non-research sources, e.g. guidelines, were considerate for inclusion.

A systematic review (SR) is the assessment of all of the research done in a systematic and explicit method to answer the relevant research question. All information sources were identified, selected and appraised to determine the relevance to the review question before any document was included in the systematic review (Magarey, 2001:376). A combination of qualitative and quantitative data were included in the sample. This enabled a comprehensive data collection and data synthesis procedure to be performed (Whittemore & Knafl, 2005a:547).

A systematic review add added value to evidence-based practice (EBP) (Whittemore & Knafl, 2005a:546 - 553). A systematic review aimed to gather and identify relevant data of high-quality studies in an unbiased manner to provide a comprehensive understanding of the phenomenon that was being researched (Grove *et al.*, 2014:619). A systematic review approach enabled the researcher to reduce potential bias (Whittemore & Knafl, 2005a:553).

Step one: Review question

A review question is formulated with the aim to guide the systematic review and ensure that the best keywords are selected, with the broader aim to find the best evidence on the topic.

The PIO format was used to syntheses data (De Souza *et al.*, 2010b:102) and is divided as follows:

- P – Population (population in the primary studies – breastfeeding women and breastfeeding infants)
- I – Intervention needed in practice (therapeutic musical elements e.g. music that is slow and soft with a repetitive tempo)
- O – Outcome (to identify and describe the elements of music to be used to improve breastfeeding outcome, to improve breastfeeding rates at six months, less breastfeeding related pain, signs of enhance production of oxytocin and prolactin, as well as improvement on the emotional state of the breastfeeding mother)

By using the PIO format, the following review question was formulated: *Which music elements will have a positive influence on the production of oxytocin and prolactin affecting human milk production and breastfeeding outcomes such as improved breastfeeding rates at six months, less breastfeeding related pain, signs of enhance production of oxytocin and prolactin, and improved emotional state of breastfeeding mother?*

Searches conducted included the following elements:

- All keywords were MeSH (Medical Subject Headings) approved.
- The systematic literature search was conducted using the EBSCOhost, Medline, SAePublications, and Science Direct databases.
- A cross-check was done by searching Google Scholar to ensure a comprehensive data search.

Step two: Inclusion/exclusion criteria

Inclusion and exclusion criteria were specified before the research commenced (Whittemore & Knafl, 2005a:58). These criteria played a significant role in selecting relevant data sources.

The inclusion criteria were formulated as follows:

1. The studies regarding physical response experienced due to music exposure.
2. Primary studies included preventing duplications of studies and data identified.

3. Studies focussing on breastfeeding difficulties from birth.

4. Studies focussing on early cessation of breastfeeding.

5. Studies focusing on the effect of music on breastfeeding outcome.

6. Studies focusing on the effect of music on pain experienced.

7. Studies focusing on the effect of music on hormones.

8. Studies focusing on the effect of music on stress.

9. Studies between 2012 and 2017 to meet the preference of the Journal of Human Lactation to have publication of not older than 5 year, at the time when the data search was conducted.

The exclusion criteria were formulated as follows:

1. All secondary studies to prevent irrelevance and out of date sources used/ non-research reports to limit the risk of bias.

2. Studies using a combination of music with another form of intervention to achieve the study goals set.

3. Studies where the population of breastfeeding infants were not followed from birth.

4. Studies which include sound as an intervention, and not music.

5. Studies focusing on breastfeeding difficulties due to anatomical defects, e.g. cleft pallet, ankyloglossia, etc.

6. Studies where the content was unrelated to the research question in this review.

Step three: Recording the literature search

The EPPI-programme (Evidence of Policy and Practice reference) was used to keep a complete record of all literature searches. This enabled accurate data recordkeeping and providing

statistical information on search terms, databases used, search strategies, and inclusion/exclusion criteria (Whittemore & Knafl, 2005a:548). The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) diagram was also used to keep track and provide a visual presentation of all searches (Moher *et al.*, 2009:264 - 269). [Preferred placement of fig 1: PRISMA flow diagram] In this step, the keywords were imported on the selected platforms (Medline, SAePublications, Ebscohost, Google Scholar, Science Direct). These keywords included (i) discontinue breastfeeding, (ii) breastfeeding challenges and physiological challenges, (iii) breastfeeding and difficulties, (iv) music and breastfeeding, (v) music therapy and pain, (vi) music therapy and hormones, and (vii) music therapy and stress.

After reading the titles and abstracts, all the articles which obviously did not fit the selection criteria for this study were discarded (n=75), duplicates were deleted (n=75), dates prior to 2012 (n=165), and the remainder of the articles (n=149) were read in full to ensure that they fitted the inclusion criteria. After reading the full text, 71 articles were selected for critical appraisal. A record was kept of all the excluded articles, and the reasons for exclusion were stated. This would ensure a proper audit trail if another researcher wanted to duplicate or update the study.

Step four: Critical appraisal and data evaluation

All studies selected by using the inclusion and exclusion data were critically appraised during the last phase of the sampling process (De Souza *et al.*, 2010b)A total of 71 articles were now forming part of the sample.

The John's Hopkins Appraisal Instrument was used for the evaluation of rigour and the characteristics of the included studies (Newhouse *et al.*, 2007:99). This tool provided standardisation to evaluate included data critically and was, therefore, the preferred tool. This instrument evaluated studies as being of high, reasonable or low quality. The strength of evidence rated from level 1-3 (one being the strongest). Each study was critically evaluated using

the John's Hopkins Appraisal Instrument and the findings recorded on a data sheet. Studies that used music as an intervention for treatment of pain, anxiety and/or stress, and effecting the hormonal balance specifically oxytocin and prolactin, were also included in the sample, as little evidence were found where the use of music had an effect on these breastfeeding related problems.

The researcher captured and concluded each study by using the data sheet (**Annexure E**) to evaluate the quality and strength of evidence collected.

The independent co-reviewer followed the same search strategy than the reviewer and concurred on the exclusion or inclusion of articles, and the level of evidence of the articles appraised. An independent co-reviewer also evaluated the included data sources to ensure a rigorous research process and results, using the same process than the researcher. This enhanced the validity and credibility of the results based on the conducted systematic literature review.

The next step in this process was to compile a data extraction document which aimed to summarise the studies selected for the sample. For this extraction document, each of the studies included had a good too high quality rating, and in the critical appraisal was listed in a table, and the population, context, methodology, main findings and limitations were presented (**annexure F**).

RESULTS

Step five: Data interpretation

Data synthesis comprised data gathered from the previous phases. Data were included from both qualitative and quantitative designs (Dixon-Woods *et al.*, 2005:15). The data extraction table was used to identify recurring themes. The following themes emerged:

i. breastfeeding difficulties (11 studies identified),

ii. music uses to reduce pain (11 studies identified),

iii. music uses to improve hormonal imbalances (9 studies identified), and

iv. music uses to reduce stress (12 studies identified).

These findings are presented in Table 1.

The findings from this process will be discussed in the results section (**annexure F**) [Preferred placement of table 1: Data synthesis table]

DISCUSSION

Pregnant women intent to breastfeed for six months at least, but only 32 % of all infants are breastfed by three months of age (Neifert & Bunik, 2013:117). Reasons for this earlier-than-desired cessation of breastfeeding could be divided into three groups, namely (i) physical factors presented as pain experienced by the lactating mother, (ii) hormonal factors, and (iii) emotional factors as seen in stress and anxiety as experienced by the lactating mother.

Pain experienced by the breastfeeding woman was reported as one of the biggest reasons for discontinue of breastfeeding. Six studies (McClellan *et al.*, 2012:518; Brown & Jordan, 2013:809; Neifert & Bunik, 2013:116; Odom *et al.*, 2013:e729; Tully & Ball, 2014:716; Hobbs *et al.*, 2016:6) indicated pain could either be from the mode of delivery (traumatic vaginal delivery or caesarian section) (McClellan *et al.*, 2012:518; Hobbs *et al.*, 2016:6), or pain related to breastfeeding (Brown & Jordan, 2013:809; Neifert & Bunik, 2013:116). The auditory pathway has an inhibiting effect on the pathway of pain. Thus, the mechanism whereby pain could be reduced by music, act as preventative of the nociceptive stimuli of the central nervous system transmission, replicating the effect of opioids to reduce pain (Engwall & Dupils, 2009:370; Şen *et al.*, 2009:224 - 226).

Another reason for discontinuing breastfeeding is the hormonal factor, where lactogenic hormones are directly responsible for the production of human milk (Lawrence & Lawrence,

2015:56). Eight studies (Hurst, 2007:588; Walshaw, 2010:1293; Aluka-Arowolo & Adekoya, 2012:2; Brownell *et al.*, 2012:609; Dashti *et al.*, 2014:712; Robert *et al.*, 2014:6; Kair & Colaizy, 2016:252; Procelli, 2016:4) cited lactation factors as a reason for earlier than the desirable cessation of breastfeeding. This could be categorised as perceived insufficient milk (PIM) supply and delayed lactogenesis II (DLII). However, stress can cause a decrease in these hormones. Two of these hormones are oxytocin and prolactin. Thus, the effective treatment and management of stress and anxiety during breastfeeding could also relate to improved human milk production (Colliver, 2015:12 - 13). This provides evidence that the three factors (physical, hormonal and emotional) inhibiting breastfeeding outcomes are entwined.

The last factor is the emotional factor referring to the stress and anxiety breastfeeding women experience and the adverse effect thereof (Jayamala *et al.*, 2015:1 - 4). Nine studies (Brown & Jordan, 2013:273; Debes *et al.*, 2013:7; Dennis *et al.*, 2013:76; Figueiredo *et al.*, 2013:332; Fox *et al.*, 2015:11; Keely *et al.*, 2015:532; Chaplin *et al.*, 2016:144; Chaput *et al.*, 2016:e103; Kossakowska, 2016:10) cited emotional factors as the reason for cessation where stress and anxiety were experienced by the nursing mother. The stress and anxiety experience could also be the underlying cause of physical and psychological diseases (Elliot *et al.*, 2011:265). Further evidence indicated that the lower the stress and anxiety levels in a breastfeeding woman, the higher is the human milk production (Jayamala *et al.*, 2015). The benefit of therapeutic music with the identified elements can be seen when a breastfeeding woman was exposed to this music in a therapeutic environment.

A lower salivary cortisol level indicate a more relaxed and less anxious feeling, and thus increased human milk production (Lai *et al.*, 2006:145; Nilsson, 2009:2159; Cervellin & Lippi, 2011:371; Zanardo *et al.*, 2011:321).

Data gathered and analysed during the first three phases were compared to findings reported by other sources (de Souza *et al.*, 2010a). This phase was critical to identify gaps in research-related

knowledge to established priorities for future studies. Gathered data were interpreted in order to answer the research question at hand. The researcher formulated conclusions from accurate data collection. All information were compared resulting in an unbiased interpretation of the literature to answer the research question best at hand (Whittemore & Knafl, 2005b:553). Through these interpretations it became evident that the use of therapeutic music can be divided into four categories: The use of the therapeutic music became evident in the research mainly with four categories:

i. music tempo,

ii. music structure,

iii. music dynamics, and

iv. music character.

Music tempo refers to slow, repetitive, meditative music used with a beat of 60–80 per minute, replicating the normal human heartbeat (Cervellin & Lippi, 2011:372). Further studies indicated that music with the element of replicating the human heartbeat had a positive calming effect on the listener's heartbeat and respiratory rate (Bernardi *et al.*, 2006:451; Lai *et al.*, 2006:140; Walworth, 2010:338; Bernatzky *et al.*, 2011:1991; Tan *et al.*, 2012:150). Music dynamics refer to soft and quiet music, with predictable aspects that decreased the heart rate, respiration and blood pressure of the listener (Bernardi *et al.*, 2006:447; Tan *et al.*, 2012:151). Music character refer to the absence of voices and lyrics (Crawford *et al.*, 2013:229) with music preference that includes only piano and strings as to voices (Walworth, 2010:336).

Musical elements that could enhance the physiology of lactation and thus, by implication, breastfeeding outcomes include slow, repetitive, meditative music with 60-80 beats per minute without voices using string instruments or pianos. An increase in these hormones was noted in breastfeeding women exposed to therapeutic music with elements listed above (Nilsson,

2009:201 - 207). These musical elements could help to reduce pain and limit the use of analgesics, increasing the release of the lactating hormones (oxytocin and prolactin), thus improving lactation and breastfeeding outcomes.

LIMITATIONS

The field of data collection was limited as few studies that aimed to identify music elements and the effect thereof could be traced that examined the effect of music on lactation. Thus, the researcher had to broaden the search to include studies that examined the effect of music on the physiological difficulties of breastfeeding (pain, hormonal imbalance and stress and anxiety) experienced by the lactating woman. A further limitation to the study was the time limit (2012 – 2017) as directed by the publishing journal that data collection must not be older than five years. This excluded research conducted prior to 2012 of which could have been of value. Although information is available about different aspects, the combination thereof with the effect of music on lactation requires further research. This review provided scientific evidence about the benefits of musical elements for enhancing the physiology of lactation and breastfeeding outcomes. However, no empirical study was conducted, and future studies should test the empirical evidence of implementing such a program. A more in-depth study of music therapy as breastfeeding intervention could be done by a specialist in both music therapy and breastfeeding to develop a programme.

CONCLUSION

Appropriate musical elements composing of slow, soft music with a repetitive tempo of 60 – 80 beats per minute replicating the normal heart beat of an adult person, without voices and preferable using string instruments and/or piano can be beneficial to improve breastfeeding outcome. These musical elements helps to set a calming mood that could help to reduce the anxiety levels and thus reduce the pain experience ofthe lactating mother. The conclusion could

then be made, when referring to the research conducted, that therapeutic music with these elements could positively influence the lactating mother to improve breastfeeding outcome at home. This use of therapeutic music could form part of a cost-effective strategy that can be used by lactating mothers at home.

DECLARATION OF CONFLICT OF INTEREST

The outcomes of the study are based solely on the findings that emerged during the systematic literature review. The researchers did not encounter any conflict of interest while conducting this study and writing the report.

FUNDING

The researchers received funding from the North-West University in the form as a study bursary. No additional funding was provided to complete this study.

ATTACHMENTS

Figure 1: PRISMA flow diagram.

Table 1: Data synthesis table.

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CHAPTER 4
CONCLUSIONS, LIMITATIONS AND RECOMMENDATION

4.1 INTRODUCTION

In this final chapter, conclusions will be presented based on the data gathered and analysed during the current review. The research question, namely "*Which musical elements could positively influence physiological responses, with specific reference to physical, hormonal and emotional factors, in the lactating woman to enhance lactation and breastfeeding outcomes?"* provided the background for this study. Also, the possibility of recommending further research on the topic were examined. Limitations encountered during the research process are also described in this chapter.

4.2 PURPOSE AND OBJECTIVES OF THE STUDY

The aim of this research was to explore the therapeutic musical elements that could influence the physiological response in the lactating woman to improve breastfeeding outcome. These physiological responses can be devided into three groups, i. Physical, ii. Hormonal, and iii. Emotional factors. The aim was to explore the positive effect these physiological responses should have on pain, hormonal imbalance and stress and anxiety as experienced by the lactating woman. Evidence collected in this review support the recommendation of the development of a therapeutic program where music with specific elements identified in this review to enhance lactation and breastfeeding outcome is used in a cost-effective method. Objective two was to identify specific musical elements that could enhance the physiological responses related to lactational and breastfeeding outcomes. These elements were identified as music with slow, repetitive, meditative music used with a beat of 60 – 80 per minute, imitating the normal human heartbeat and thus has a positive calming effect on the lactating mother resulting in a decrease in anxiety and pain experienced.

4.3 LIMITATIONS OF THE STUDY

Scientific evidence on the use of music to enhance lactation and to address selected physiological breastfeeding challenges proved to be limited. However, research had been done on the effect of music on the different physiological challenges relevant to breastfeeding (pain, hormonal imbalance, stress and anxiety).

Culture was not taken into account in this study. It is unclear whether exposure to cultural (traditional) music may have a similar result. The effect of music exposure during pregnancy

was not taken into account, and further studies are recommended to determine the effect thereof. No empirical study was conducted. Future studies should test the empirical evidence of implementing such a program.

4.4 RECOMMENDATIONS

4.3.1 Recommendations for practice

Scientific evidence revealed the benefit of using music to enhance the physiology of lactation and breastfeeding outcomes. Lactating mothers should be introduced to the use of therapeutic music as a cost-effective home strategy to enhance milk production and ejection and breastfeeding outcomes. The focus of the music must be on slow tempo, with a beat of 60 to 80 beats per minute, piano or string instrumental music, with repetition as research support these elements to positively influence the human milk production by reducing pain experienced by the breastfeeding mother. Furthermore, a positive influence can be seen on the lactation hormonal complex, and the relaxing effect of music on the breastfeeding mother.

4.3.2 Recommendations for further research

The physiological effect of music appears to be inadequately understood, and further research is required to study this topic. Future studies should develop and test a programme comprising specific elements of music (slow, soft, repetitive music with a tempo of 60-80 beats per minute replicating the heartbeat of a person, without voices, using pianos or string instruments). Such a programme could provide a cost-effective strategy to enhance lactation and thus breastfeeding rates while reducing anxiety amongst breastfeeding women in a cost-effective, safe way. Another possibility for future research is to study the effect that such music will have on the breastfeeding baby and the baby's sleep-wake cycle. Moreover, the effect of culture (traditional) music on the effect of the experience by the breastfeeding woman to the music were not taken into consideration.

4.3.3 Recommendations for education

Nursing and midwifery curricula should include information on the benefit of music to enhance the physiology of lactation. Such information should be shared with women during antenatal classes and in the post-partum wards to enhance breastfeeding outcomes.

4.3.4 Recommendations for policy

Policies should be adjusted in maternity wards to include the use of the mother's preferred music to enhance lactation and breastfeeding outcomes, specifying the benefits of music to the mother and possibly also to the infant.

4.4 CLOSING STATEMENT

Breastfeeding is one of the most exceptional experiences of a new mother and is the gold standard for infants' nutrition (Dumphy *et al.*, 2016:633). However, lactating women could encounter breastfeeding challenges due to physical and emotional experiences, causing the early cessation of exclusive breastfeeding (EBF). Reportedly EBF rates dropped to 40.7% at three months, and to 18.8% at six months after birth in the United States of America (Dumphy *et al*., 2016:633). In South Africa, EBF rates were reported to be 11.9% at three, and 1.5% at six months of age (Mhlanga, 2008:132-138). This systematic review indicates that music, with elements of musical tempo, melodic structure, dynamic and character, could have a positive effect on the physiology of lactation. Thus, also on breastfeeding outcomes, either due to its ability to reduce pain, improve hormonal balances involved in the lactation process, or by decreasing listeners' anxiety levels.

Although more research needs to be done in this field, this systematic review's results indicate that music therapy could offer a cost-effective strategy to improve the physiology of lactation and breastfeeding outcomes. Enhanced breastfeeding outcomes could help to reduce the infant morbidity and mortality rates in many countries. These outcomes included EBF for the infant's first six months of life and breastfeeding complemented with solids from six to twelve months of age. This systematic literature review indicated that music therapy might offer a cost-effective, easily accessible home-based strategy to enhance lactation and breastfeeding outcomes.

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ANNEXURE A – KEYWORDS

KEYWORDS SEARCH	HITS					NR SELECTED FOR REVIEW	REASON FOR EXCLUSION				ACCUMULATIVE TOTAL OF INCLUDED RESOURCES
	MEDLINE	SAe PUBLICATION	EBSCOHOST	GOOGLE SCHOLAR	SCIENCE DRECT		NOT RELEVENT	DUPLICATIONS	SEDONCARY DATA	LANGUAGE BARRIER	
Discontinue breastfeeding	38	1	0	16 700	27	186	16498	23	56	3	186
Breastfeeding challenges and physiological responses	0	0	169	17 400	0	23	17411	54	76	5	209
Breastfeeding and difficulties	229	3	340	17 900	100	31	18226	33	48	4	240
Music therapy and breastfeeding	2	0	2	4 410	0	7	4401	1	4	1	247
Music and breastfeeding	6	0	9	7 220	4	134	7007	5	87	6	381
Music therapy and pain	297	3	172	28 700	71	67	29027	75	66	8	448
Music therapy and hormones	1	0	2	12 000	3	5	11974	9	17	1	453
Music therapy and stress	58	0	37	29 400	47	12	29493	11	23	3	465

ANNEXURE B – JOHN'S HOPKINS CRITICAL APPRAISAL INSTRUMENT

JHNEBP Research Evidence Appraisal

Evidence Level:_____

ARTICLE TITLE:					NUMBER:
AUTHOR(S):					DATE:
JOURNAL:					
SETTING:				SAMPLE (COMPOSITION/SIZE)	
☐ Experimental	☐ Meta-analysis	☐ Quasi-experimental	☐ Non-experimental	☐ Qualitative	☐ Meta-synthesis
Does this study apply to my patient population?				☐Yes	☐No
If the answer is No, STOP here (unless there are similar characteristics).					
Strength of Study Design					
• Was sample size adequate and appropriate? • Were study participants randomized? • Was there an intervention? • Was there a control group? • If there was more than one group, were groups equally treated, except for the intervention? • Was there adequate description of the data collection methods				☐Yes ☐Yes ☐Yes ☐Yes ☐Yes ☐Yes	☐No ☐No ☐No ☐No ☐No ☐No
Study Results					
• Were results clearly presented? • Was an interpretation/analysis provided?				☐Yes ☐Yes	☐No ☐No
Study Conclusions					
• Were conclusions based on clearly presented results? • Were study limitations identified and discussed?				☐Yes ☐Yes	☐No ☐No
PERTINENT STUDY FINDINGS AND RECOMMENDATIONS					
Will the results help me in caring for my patients?				☐Yes	☐No

Evidence Rating (scales on back)

Strength of Evidence Rating			
Quality Rating (check one)	☐ High (A)	☐ Good (B)	☐ Low/major flaws(C)

STRENGTH OF EVIDENCE
LEVEL 1 (HIGHEST)

EXPERIMENTAL STUDY (RANDOMIZED CONTROLLED TRAIL OR RCT)

- Study participants (subjects) are randomly assigned to either a treatment (TX) or control (non-treatment) group.
- May be:
  - Blind: neither subject nor investigator knows which TX subject is receiving.
  - Double-blind: neither subject nor investigator knows which TX subject is receiving.
  - Non-blind: both subject and investigator know which TX subject is receiving; used when it is felt that the knowledge of treatment is unimportant.

META-ANALYSIS OF RCTS

- Quantitatively synthesizes and analyzes results of multiple primary studies addressing a similar research question
- Statistically pools results from independent but combinable studies
- Summary statistic (effect size) is expressed in terms of direction (positive, negative, or zero) and magnitude (high, medium, small)

LEVEL 2

QUASI-EXPERIMENTAL STUDY

- Always includes manipulation of an independent variable
- Lacks either random assignment or control group.
- Findings must be considered in light of threats to validity (particularly selection)

LEVEL 3

NON-EXPERIMENTAL STUDY

- No manipulation of the independent variable.
- Can be descriptive, comparative, or relational.
- Often uses secondary data.
- Findings must be considered in light of threats to validity (particularly selection, lack of severity or co-morbidity adjustment).

QUALITATIVE STUDY

- Explorative in nature, such as interviews, observations, or focus groups.
- Starting point for studies of questions for which little research currently exists.
- Sample sizes are usually small and study results are used to design stronger studies that are more objective and quantifiable.

META-SYNTHESIS

- Research technique that critically analyzes and synthesizes findings from qualitative research
- Identifies key concepts and metaphors and determines their relationships to each other
- Aim is not to produce a summary statistic, but rather to interpret and translate findings

QUALITY RATING (SCIENTIFIC EVIDENCE)

A High quality: consistent results, sufficient sample size, adequate control, and definitive conclusions; consistent recommendations based on extensive literature review that includes thoughtful reference to scientific evidence.

B Good quality: reasonably consistent results, sufficient sample size, some control, and fairly definitive conclusions; reasonably consistent recommendations based on fairly comprehensive literature review that includes some reference to scientific evidence

C Low quality or major flaws: little evidence with inconsistent results, insufficient sample size, conclusions cannot be drawn.

ANNEXURE C – SUMMARY OF CRITICAL APPRAISAL

This annexure provide a summary of evidence collected using the Johns' Hopkins critical appraisal instrument for research. The aim of the critical appraisal is to evaluate studies to determine if studies must be included in the review. A full synthesis and data extraction can be seen in annexure D. Only studies included in this systematic review where given below, as all studies that were excluded where deleted from the table.

Themes of studies to be included in review, as stated by numbers in the table below. Numbers were given to themes as space in table were limited:

1. Studies focusing on breastfeeding difficulties from birth
2. Studies focusing on early cessation of breastfeeding
3. Studies focusing on the effect of music on breastfeeding outcome
4. Studies focusing on the effect of music on pain experienced
5. Studies focusing on the effect of music on hormones
6. Studies focusing on the effect of music on stress
7. Studies focusing on the physical response experience due to music exposure

Author		(Adams *et al.*, 2015)	(Aluka-Arowolo & Adekoya, 2012)	(Alparslan *et al.*, 2016)	(Antonakopoulou, 2016)	(Bhana & Botha, 2014)	(Bergstrom *et al.*, 2014)	(Bradshaw *et al.*, 2012)	(Brown & Jordan, 2013)	(Brown *et al.*, 2016)
Keywords		**Music and pain**	**Discontinue breastfeeding**	**Music and pain**	**Discontinue breastfeeding**	**Music and pain**	**Music and physiology**	**Music and pain**	**Discontinue breastfeeding**	**Breastfeeding difficulties**
Sample (composition/size)		1835	110	37	12	9	24	53	284	505
Study Design	Experimental			X						
	Meta-Analysis									
	Quasi Experimental	X					X	X		
	Non Experimental								X	X
	Qualitative		X		X	X				
	Meta Synthesis									
Strength of study design	Randomized study participants	X	X	X				X	X	X
	Was there an intervention?	X		X		X	X	X		
	Was there a control group?			X						
	Were multiple groups equally treated except for the intervention?			X				X		
	Was there adequate description of data collection methods?	X	X	X	X	X	X	X	X	X

Study results	Were results clearly presented?	X	X	X	X	X	X	X	X	X
	Was an interpretation/analysis provided?	X	X	X	X	X	X	X	X	X
Study conclusion	Were conclusion based on clearly presented results?	X	X	X	X	X	X	X	X	X
	Were study limitations identified and discussed?	X	X	X	X	X	X	X	X	X
Evidence rating	Quality	A	B	A	B	A	A	A	B	A
	Level	2	3	1	3	3	2	2	3	3
Outcome	Included with reason	4	2	4	3	4, 7	7	3	1, 2	1, 2
Co-reviewer	Agree	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Disagree									

Author		(Brownell *et al.*, 2012)	(Chanda & Levitin, 2013)	(Chaplin *et al.*, 2016)	(Chaput *et al.*, 2016)	(Chen *et al.*, 2013)	(Crawford *et al.*, 2013)	(Dashti *et al.*, 2014)	(Dehcheshmeh & Rafiei, 2015)	(Dennis *et al.*, 2014)
Keywords		**Discontinue breastfeeding**	**Characteristics of music**	**Breastfeeding difficulties**	**Breastfeeding difficulties**	**Music and stress/ characteristic of music**	**Music and stress**	**Breastfeeding difficulties**	**Music and pain**	**Breastfeeding difficulty**
Sample (composition/size)		2491		8	442	100	38	373	90	656
Study Design	Experimental						X		X	X
	Meta-Analysis									
	Quasi Experimental					X				
	Non Experimental	X		X	X			X		
	Qualitative									
	Meta Synthesis		X							
Strength of study design	Randomized study participants				X	X	X	X	X	X
	Was there an intervention?					X	X		X	X
	Was there a control group?					X	X		X	
	Were multiple groups equally treated except for the intervention?					X	X		X	
	Was there adequate description of data collection methods?	X		X	X	X	X	X	X	X

Study results	Were results clearly presented?	X	X	X	X	X	X		X	X
	Was an interpretation/analysis provided?	X	X	X	X	X	X	X	X	X
Study conclusion	Were conclusion based on clearly presented results?	X	X	X	X	X	X	X	X	X
	Were study limitations identified and discussed?	X		X	X	X	X			X
Evidence rating	Quality	A	B	B	A	A	A	B	B	A
	Level	3	3	3	3	2	1	2	1	1
Outcome	Inclusion reason	1, 2	7	1	2	6	6	1, 2	4	1
Co-reviewer	Agree	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Disagree									

Author		(de Jager *et al.*, 2014)	(Du Plessis & Pereira, 2013)	(Du Plessis, 2016)	(Dennis *et al.*, 2013)	(Debes *et al.*, 2013)	(Fancourt *et al.*, 2014)	(Figueiredo *et al.*, 2013)	(Fox *et al.*, 2015)	(Fredenburg & Silverman, 2014)
Keywords		**Breastfeeding difficulties**	**Breastfeeding difficulties**	**Breastfeeding difficulties**	**Discontinue breastfeeding**	**Breastfeeding difficulties/ Discontinue breastfeeding**	**Physical response triggered by music/ music and stress**	**Breastfeeding difficulties/ Discontinue breastfeeding**	**Breastfeeding difficulties**	**Music and pain/ music and stress**
Sample (composition/size)		174			1503	18	63		51	32
Study Design	Experimental									X
	Meta-Analysis									
	Quasi Experimental									
	Non Experimental	X			X					
	Qualitative							X	X	
	Meta Synthesis		X	X		X	X			
Strength of study design	Randomized study participants	X			X				X	X
	Was there an intervention?									X
	Was there a control group?									X
	Were multiple groups equally treated except for the intervention?				X					X

	Was there adequate description of data collection methods?	X			X		X			X
Study results	Were results clearly presented?	x			X	X	X	X	X	X
	Was an interpretation/analysis provided?	X	X	X	X	X	X	X	X	X
Study conclusion	Were conclusion based on clearly presented results?	X	X	X	X	X	X	X	X	X
	Were study limitations identified and discussed?		X		X	X	X			X
Evidence rating	Quality	B	B	B	A	A	A	B	B	A
	Level	3	3	3	3	3	3	3	3	1
Outcome	Inclusion reason	2	1, 2	1, 2	1	1, 2	6, 7	1, 2	1	4
Co-reviewer	Agree	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Disagree									

Author		(French *et al.*, 2016)	(Gangrade, 2012)	(Gatti, 2008)	(Geddes *et al.*, 2013)	(Ghaffaripour *et al.*, 2013)	(Goosen *et al.*, 2014)	(Gutgsell *et al.*, 2013)	(Hall *et al.*, 2014)	(Hobbs *et al.*, 2016)
Keywords		**Breastfeeding difficulties**	**Characteristics of music**	**Breastfeeding difficulty**	**Breastfeeding difficulties**	**Characteristics of music, Music and pain**	**Breastfeeding difficulties**	**Music and pain**	**Breastfeeding difficulties**	**Breastfeeding difficulties, breastfeeding discontinuation**
Sample (composition/size)		117		20		50	91	200	170	3021
Study Design	Experimental							X		
	Meta-Analysis									X
	Quasi Experimental					X	X		X	
	Non Experimental									
	Qualitative	X								
	Meta Synthesis		X	X	X					
Strength of study design	Randomized study participants							X		X
	Was there an intervention?					X	X	X	X	X
	Was there a control group?							X		X
	Were multiple groups equally treated except for the intervention?							X	X	X
	Was there adequate description of data collection methods?	X		X	X	X	X	X	X	X

Study results	Were results clearly presented?	X		X	X	X	X	X	X	X
	Was an interpretation/analysis provided?	X	X	X	X	X	X	X	X	X
Study conclusion	Were conclusion based on clearly presented results?	X	X	X	X	X	X	X	X	X
	Were study limitations identified and discussed?	X	X	X	X	X	X	X	X	X
Evidence rating	Quality	A	B	A	B	A	A	A	A	A
	Level	3	3	3	3	2	3	1	2	1
Outcome	Inclusion reason	1	7	1, 2	?	1, 4	1	4	1, 2	1, 2
Co-reviewer	Agree	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Disagree									

Author		(Hole *et al.*, 2015)	(Holt, 2014)	(Hosseini *et al.*, 2013)	(Hsieh *et al.*, 2014)	(Jafari *et al.*, 2012)	(Jayamala *et al.*, 2015)	(Jiang *et al.*, 2013)	(Kair & Colaizy, 2016)	(Keely *et al.*, 2015)
Keywords		**Music and pain**	**Characteristics of music, Music and stress**	**Music and pain, Music and stress**	**Music and pain**	**Music and pain**	**Music and hormones, Music and stress**	**Characteristics of music, Music and stress**	**Breastfeeding difficulty, breastfeeding discontinue**	**Breastfeeding difficulty**
Sample (composition/size)		73		30	48	60	30	144	19 145	28
Study Design	Experimental			X	X	X	X	X		
	Meta-Analysis	X	X							
	Quasi Experimental									
	Non Experimental								X	
	Qualitative									X
	Meta Synthesis									
Strength of study design	Randomized study participants			X	X	X	X	X	X	X
	Was there an intervention?			X	X	X	X	X		
	Was there a control group?			X	X	X	X	X		
	Were multiple groups equally treated except for the intervention?			X	X	X	X	X		
	Was there adequate description of data collection methods?	X	X	X	X	X	X	X		

Study results	Were results clearly presented?	X	X	X	X	X	X	X	X	X
	Was an interpretation/analysis provided?	X	X	X	X	X	X	X	X	X
Study conclusion	Were conclusion based on clearly presented results?	X	X	X	X	X	X	X	X	X
	Were study limitations identified and discussed?	X	X	X	X	X	X	X	X	
Evidence rating	Quality	A	A	A	A	A	A	A	A	B
	Level	1	1	1	1	1	1	1	3	3
Outcome	Inclusion reason	4	6, 7	5, 6	4	4	5, 6	6, 7	1, 2	1
Co-reviewer	Agree	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Disagree									

Author		(Koelsch & Jäncke, 2015)	(Konieczna-Nowak, 2015)	(Korhan *et al.*, 2014)	(Kossakowska, 2016)	(Krishnaswamy & Nair, 2016)	(Leung, 2016)	(Linnemann *et al.*, 2015)	(Li & Dong, 2012)	(Mauri *et al.*, 2012)
Keywords		**Characteristics of music**	**Characteristics of music**	**Music and pain**	**Breastfeeding discontinue**	**Music and pain**	**Breastfeeding difficulty**	**Music and stress**	**Music and pain, Music and stress**	**Breastfeeding difficulty**
Sample (composition/size)				30	284	14	69	25	60	15
Study Design	Experimental					X		X	X	
	Meta-Analysis									
	Quasi Experimental			X	X		X			
	Non Experimental									
	Qualitative									X
	Meta Synthesis	X	X							
Strength of study design	Randomized study participants					X		X	X	X
	Was there an intervention?			X	X	X	X	X	X	X
	Was there a control group?					X		X	X	
	Were multiple groups equally treated except for the intervention?			X	X	X	X	X	X	X
	Was there adequate description of data collection methods?		X	X	X	X	X	X	X	X

Study results	Were results clearly presented?	X	X	X	X	X	X	X	X	X
	Was an interpretation/analysis provided?	X	X	X	X	X	X	X	X	X
Study conclusion	Were conclusion based on clearly presented results?	X	X	X	X	X	X	X	X	X
	Were study limitations identified and discussed?		X	X	X	X	X	X	X	X
Evidence rating	Quality	B	A	A	A	A	A	A	A	A
	Level	3	3	2	2	1	2	1	1	3
Outcome	Inclusion reason	7	7	4	1, 2	4	1	6	4, 6	1
Co-reviewer	Agree	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Disagree									

Author		(McClellan *et al.*, 2012)	(Mellor *et al.*, 2013)	(Matsota *et al.*, 2013)	(Mofredj *et al.*, 2016)	(Mortazavi *et al.*, 2015)	(Mercadíe *et al.*, 2015)	(Odom *et al.*, 2013)	(Neifert & Bunik, 2013)	(Raglio *et al.*, 2012)	(Ouyang *et al.*, 2016)
Keywords		**Breastfeeding difficulty, breastfeeding discontinue**	**Breastfeeding difficulty**	**Music and pain**	**Music and pain Music and hormones, Music and stress**	**Breastfeeding difficulty**	**Music and pain, Music and stress**	**Breastfeeding difficulty**	**Breastfeeding difficulty, breastfeeding discontinuation**	**Music and stress**	**Breastfeeding difficulty**
Sample (composition/size)		29				358		1177		8	76
Study Design	Experimental								X	X	
	Meta-Analysis										
	Quasi Experimental	X						X			
	Non Experimental										
	Qualitative					X					X
	Meta Synthesis		X	X	X		X				
Strength of study design	Randomized study participants					X	X		X	X	X
	Was there an intervention?	X				X				X	X
	Was there a control group?	X								X	X
	Were multiple groups equally treated except for the intervention?	X				X				X	X

	Was there adequate description of data collection methods?	X				X	X	X	X	X	X
Study results	Were results clearly presented?	X				X	X	X	X	X	X
	Was an interpretation/analysis provided?	X	X	X	X	X	X	X	X	X	X
Study conclusion	Were conclusion based on clearly presented results?	X	X	X	X	X	X	X	X	X	X
	Were study limitations identified and discussed?	X				X	X	X	X	X	X
Evidence rating	Quality	A	B	B	B	A	A	A	A	A	A
	Level	2	3	3	3	3	3	2	3	1	3
Outcome	Inclusion reason	1,2	1	4	4, 5, 6	1	4, 6	2	1, 2	6	1
Co-reviewer	Agree	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Disagree										

Author		(Robert *et al.*, 2014)	(Rozga *et al.*, 2015)	(Roostaee *et al.*, 2015)	(Simavli *et al.*, 2014)	(Sin & Chow, 2015)	(Scott *et al.*, 2015)	(Tarrant *et al.*, 2014)	(Thomas, 2016)	(Zengin *et al.*, 2013)	(Thoma *et al.*, 2013)
Keywords		**Breastfeeding discontinue**	**Breastfeeding discontinuation**	**Breastfeeding discontinuation**	**Music and pain**	**Music and pain**	**Breastfeeding discontinue**	**Breastfeeding discontinue**	**Breastfeeding difficulties**	**Music and Pain, Music and stress**	**Music and stress**
Sample (composition/size)		525	12 923	523	161	8	389	1242	75	100	6
Study Design	Experimental				X				X		X
	Meta-Analysis	X									
	Quasi Experimental										
	Non Experimental			X							
	Qualitative		X				X	X		X	
	Meta Synthesis					X					X
Strength of study design	Randomized study participants	X	X		X			X	X		X
	Was there an intervention?	X			X				X		X
	Was there a control group?				X				X		X
	Were multiple groups equally treated except for the intervention?	X	x	X	X			X	X		X
	Was there adequate description of data collection methods?	X	X	X	X	X	X	X	X	X	X

Study results	Were results clearly presented?	X	X	X	X	X	X	X	X	X	X
	Was an interpretation/analysis provided?	X	X	X	X	X	X	X	X	X	X
Study conclusion	Were conclusion based on clearly presented results?	X	X	X	X	X	X	X	X	X	X
	Were study limitations identified and discussed?	X	X	X	X	X		X	X	X	X
Evidence rating	Quality	A	A	A	A	A	B	A	A	A	A
	Level	2	3	3	1	3	3	3	1	3	1
Outcome	Inclusion reason	2	1	1, 2	4	4	1, 2	1	4, 6	1	6
Co-reviewer	Agree	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Disagree										

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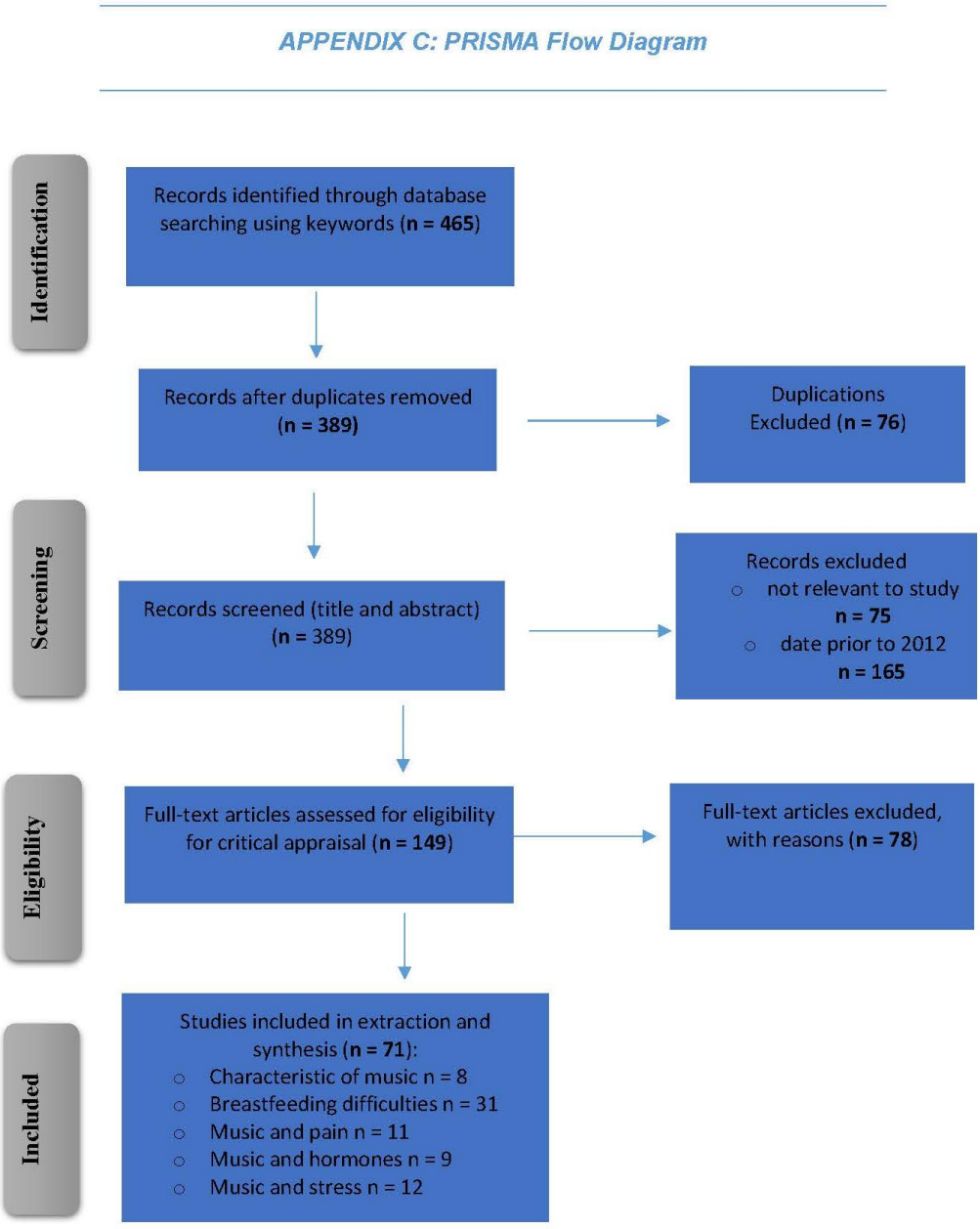
ANNEXURE D – PRISMA FLOW CHART



ANNEXURE E – ARTICLES INCLUDED AFTER CRITICAL APPRAISAL

Themes of studies included in sample:

8. Studies focusing on breastfeeding difficulties from birth
9. Studies focusing on early cessation of breastfeeding
10. Studies focusing on the effect of music on breastfeeding outcome
11. Studies focusing on the effect of music on pain experienced
12. Studies focusing on the effect of music on hormones
13. Studies focusing on the effect of music on stress
14. Studies focusing on the physical response experience due to music exposure

TITLE AND AUTHOR	1. Breastfeeding difficulties	2. Early breastfeeding cessation	3. Music and breastfeeding	4. Music and pain	5. Music and hormones	6. Music and stress	7. Physiological responses
1. Use of pharmacological and non-pharmacological labour pain management techniques and their relationship to maternal and infant birth outcomes: Examination of a nationally representative sample of 1835 pregnant women (Adams et al., 2015)				X			
2. Effects of music on pain in patients with fibromyalgia (Alparslan et al., 2016)				X			
3. Exclusive Breastfeeding in the Contexts of Socio-Cultural Challenges and Mothers' Health in Rural and Mixed Urban Areas of Ijebu, South Western Nigeria (Aluka-Arowolo & Adekoya, 2012)		X					
4. Music therapy for improving premature infants' wellbeing and communication skills and enhancing mother-infant bonding: a case study (Antonakopoulou, 2016)			X				

TITLE AND AUTHOR	1. Breastfeeding difficulties	2. Early breastfeeding cessation	3. Music and breastfeeding	4. Music and pain	5. Music and hormones	6. Music and stress	7. Physiological responses
5. The therapeutic use of music as experienced by cardiac surgery patients of an intensive care unit (Bhana & Botha, 2014)				X		X	
6. Using music as a signal for biofeedback (Bergstrom et al., 2014)							X
7. Understanding the relationship between breastfeeding and postnatal depression: the role of pain and physical difficulties (Brown et al., 2016)		X					
8. Delayed onset lactogenesis II predicts the cessation of any or exclusive breastfeeding (Brownell et al., 2012)	X						
9. Impact of birth complications on breastfeeding duration: an internet survey (Brown & Jordan, 2013)	X						
10. Effects of Music Engagement on Responses to Painful Stimulation (Bradshaw et al., 2012)				X			
11. The neurochemistry of music (Chanda & Levitin, 2013)							X
12. Maternal perceptions of breastfeeding difficulty after caesarean section with regional anaesthesia: A qualitative study (Chaplin et al., 2016)		X					
13. Breastfeeding difficulties and supports and risk of postpartum depression in a cohort of women who have given birth in Calgary: a prospective cohort study (Chaput et al., 2016)		X					
14. Fifteen-minute music intervention reduces pre-radiotherapy anxiety in oncology patients (Chen et al., 2013)						X	

TITLE AND AUTHOR	1. Breastfeeding difficulties	2. Early breastfeeding cessation	3. Music and breastfeeding	4. Music and pain	5. Music and hormones	6. Music and stress	7. Physiological responses
15. Effects of music therapy on perception of stress, relaxation, mood, and side effects in patients on a solid organ transplant unit: A randomized effectiveness study (Crawford et al., 2013)						X	
16. Predictors of Breastfeeding Duration among Women in Kuwait: Results of a Prospective Cohort Study (Dashti et al., 2014)	X	X					
17. Complementary and alternative therapies to relieve labor pain: A comparative study between music therapy and Hoku point ice massage (Dehcheshmeh & Rafiei, 2015)				X			
18. The role of psychosocial factors in exclusive breastfeeding to six months postpartum (de Jager et al., 2014)		X					
19. Commitment and capacity for the support of breastfeeding in South Africa: a paediatric food-based dietary guideline (Du Plessis & Pereira, 2013)	X	X					
20. Breastfeeding in South Africa: are we making progress? (Du Plessis, 2016)	X	X					
21. Prediction of Duration of Breastfeeding among Migrant and Canadian-Born Women: Results from a Multi-Center Study (Dennis et al., 2013)	X						
22. Time to initiation of breastfeeding and neonatal mortality and morbidity: a systematic review (Debes et al., 2013)	X	X					
23. The psychoneuroimmunological effects of music: A systematic review and a new model (Fancourt et al., 2014)						X	X

TITLE AND AUTHOR	1. Breastfeeding difficulties	2. Early breastfeeding cessation	3. Music and breastfeeding	4. Music and pain	5. Music and hormones	6. Music and stress	7. Physiological responses
24. Breastfeeding and postpartum depression: state of the art review (Figueiredo et al., 2013)	X	X					
25. UK women's experiences of breastfeeding and additional breastfeeding support: a qualitative study of Baby Café services (Fox et al., 2015)	X						
26. Effects of music therapy on positive and negative affect and pain with hospitalized patients recovering from a blood and marrow transplant: A randomized effectiveness study (Fredenburg & Silverman, 2014)				X			
27. Labor Epidural Analgesia and Breastfeeding: A Systematic Review (French et al., 2016)	X						
28. Does circadian disruption play a role in the metabolic–hormonal link to delayed lactogenesis II? (Fu et al., 2015)	X	X					
29. The Effect of Music on the Production of Neurotransmitters, Hormones, Cytokines, and Peptides: A Review (Gangrade, 2012)	X						
30. Maternal Perceptions of Insufficient Milk Supply in Breastfeeding (Gatti, 2008)		X	X				
31. Preterm birth: Strategies for establishing adequate milk production and successful lactation (Geddes et al., 2013)	X						
32. Music can effectively reduce pain perception in women rather than men (Ghaffaripour et al., 2013)				X			X
33. Factor impeding exclusive breastfeeding in a low-income area of the Western Cape province of South Africa (Goosen et al., 2014)	X						

TITLE AND AUTHOR	1. Breastfeeding difficulties	2. Early breastfeeding cessation	3. Music and breastfeeding	4. Music and pain	5. Music and hormones	6. Music and stress	7. Physiological responses
34. Music Therapy Reduces Pain in Palliative Care Patients: A Randomized Controlled Trial (Gutgsell et al., 2013)				X			
35. 'It's those first few weeks': Women's views about breastfeeding support in an Australian outer metropolitan region (Hall et al., 2014)	X						
36. The impact of caesarean section on breastfeeding initiation, duration and difficulties in the first four months postpartum (Hobbs et al., 2016)	X	X					
37. Music as an aid for postoperative recovery in adults: a systematic review and meta-analysis (Hole et al., 2015)				X			
38. Cochrane corner: Music to reduce stress and anxiety for people with coronary heart disease (Holt, 2014)						X	X
39. Investigating the effect of music on labor pain and progress in the active stage of first labor (Hosseini et al., 2013)				X		X	
40. Well-Loved Music Robustly Relieves Pain: A Randomized, Controlled Trial (Hsieh et al., 2014)				X			
41. The effects of listening to preferred music on pain intensity after open heart surgery (Jafari *et al.*, 2012)				X			
42. Impact of Music Therapy on Breast Milk Secretion in Mothers of Premature Newborn (Jayamala *et al.*, 2015)					X	X	
43. The effects of sedative and stimulative music on stress reduction depend on music preference (Jiang *et al.*, 2013)						X	X

TITLE AND AUTHOR	1. Breastfeeding difficulties	2. Early breastfeeding cessation	3. Music and breastfeeding	4. Music and pain	5. Music and hormones	6. Music and stress	7. Physiological responses
44. When Breast Milk Alone Is Not Enough: Barriers to Breastfeeding Continuation among Overweight and Obese Mothers (Kair & Colaizy, 2016)	X	X					
45. Barriers to breast-feeding in obese women: A qualitative exploration (Keely *et al.*, 2015)	X						
46. The Effects of Music Therapy on Pain in Patients with Neuropathic Pain (Korhan *et al.*, 2014)							
47. Incidence and determinants of postpartum depression among healthy pregnant women and high-risk pregnant women (Kossakowska, 2016)							
48. Effect of Music Therapy on Pain and Anxiety Levels of Cancer Patients: A Pilot Study (Krishnaswamy & Nair, 2016)							
49. Brain correlates of music-evoked emotions (Koelsch & Jäncke, 2015)							X
50. Breast pain in lactating mothers (Leung, 2016)	X						
51. Preoperative music intervention for patients undergoing caesarean delivery (Li & Dong, 2012)				X		X	
52. Music listening as a means of stress reduction in daily life (Linnemann *et al.*, 2015)						X	
53. Music's Use for Anesthesia and Analgesia (Matsota *et al.*, 2013)				X			
54. Exploring the mother's perception of latching difficulty in the first days after birth: An interview study in an Italian hospital (Mauri *et al.*, 2012)	X						

TITLE AND AUTHOR	1. Breastfeeding difficulties	2. Early breastfeeding cessation	3. Music and breastfeeding	4. Music and pain	5. Music and hormones	6. Music and stress	7. Physiological responses
55. Nipple Pain during Breastfeeding with or without Visible Trauma (McClellan *et al.*, 2012)	X	X					
56. Improving breastfeeding rates in an ''at risk'' population (Mellor *et al.*, 2013)	X						
57. Effects of Listening to Music versus Environmental Sounds in Passive and Active Situations on Levels of Pain and Fatigue in Fibromyalgia (Mercadíe *et al.*, 2015)				X		X	
58. Music therapy, a review of the potential therapeutic benefits for the 59. critically ill (Mofredj *et al.*, 2016)				X	X		
60. Breastfeeding Practices During the First Month Postpartum and Associated Factors: Impact on Breastfeeding Survival (Mortazavi *et al.*, 2015)	X						
61. Overcoming Clinical Barriers to Exclusive Breastfeeding (Neifert & Bunik, 2013)	X	X					
62. Reasons for Earlier Than Desired Cessation of Breastfeeding (Odom *et al.*, 2013)	X						
63. A survey on difficulties and desires of breast-feeding women in Wuhan, China (Ouyang *et al.*, 2016)	X						
64. Music Therapy, Emotions and the Heart: a pilot study (Raglio *et al.*, 2012)						X	
65. The Reasons for Early Weaning, Perceived Insufficient Breast Milk, and Maternal Dissatisfaction: Comparative Studies in Two Belgian Regions (Robert *et al.*, 2014)	X						
66. Breast-feeding Continuation in South-Eastern of Iran: the Associated Factors (Roostaee *et al.*, 2015)		X					

TITLE AND AUTHOR	1. Breastfeeding difficulties	2. Early breastfeeding cessation	3. Music and breastfeeding	4. Music and pain	5. Music and hormones	6. Music and stress	7. Physiological responses
67. Self-Reported Reasons for Breastfeeding Cessation among Low-Income Women Enrolled in a Peer Counseling Breastfeeding Support Program (Rozga *et al.*, 2015)		X					
68. A Comparison of Maternal Attitudes to Breastfeeding in Public and the Association with Breastfeeding Duration in Four European Countries: Results of a Cohort Study (Scott *et al.*, 2015)	X	X					
69. Music Therapy on Anxiety, Stress and Maternal-fetal Attachment in Pregnant Women During Transvaginal Ultrasound (Shin & Kim, 2011)				X			
70. Effect of music therapy during vaginal delivery on postpartum pain relief and mental health (Simavli *et al.*, 2014)				X			
68. Factors contributing to early breast-feeding cessation among Chinese mothers: An exploratory study (Tarrant *et al.*, 2014)		X					
69. The Effect of Music on the Human Stress Response (Thoma *et al.*, 2013)							X
70. Barriers to Exclusive Breastfeeding Among Mothers During the First Four Weeks Postpartum (Thomas, 2016)		X					
71. Effects of music therapy on pain and anxiety in patients undergoing port catheter placement procedures (Zengin *et al.*, 2013)							x

Adams, J., Frawley, J., Steel, A., Broom, A. & Sibbritt, D. 2015. Use of pharmacological and non-pharmacological labour pain management techniques and their relationship to maternal and infant birth outcomes: Examination of a nationally representative sample of 1835 pregnant women. *Midwifery*, 31(4):458-463.

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Antonakopoulou, S. 2016. Music therapy for improving premature infants' well-being and communication skills and enhancing mother-infant bonding: a case study.

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Bhana, V.H. & Botha, A.D.H. 2014. The therapeutic use of music as experienced by cardiac surgery patients of an intensive care unit. *Health SA Gesondheid (Online)*, 19(1):01-09.

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Zengin, S., Kabul, S., Al, B., Sarcan, E., Doğan, M. & Yildirim, C. 2013. Effects of music therapy on pain and anxiety in patients undergoing port catheter placement procedure. *Complementary Therapies In Medicine*, 21(6):689-696.

ANNEXURE F – DATA EXTRACTION AND SYNTHESIS TABLE

TITLE AND AUTHOR	MAIN FINDINGS	CATEGORIES DERIVED FROM SYNTHESIS				
		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
1. Use of pharmacological and non-pharmacological labour pain management techniques and their relationship to maternal and infant birth outcomes: Examination of a nationally representative sample of 1835 pregnant women (Adams *et al.*, 2015)	Women who received pethidine or epidural during labour or thereafter, are more prone to discontinue breastfeeding before 6 weeks post-partum. Pharmacological pain management during labour and thereafter has a negative impact on breastfeeding duration		X			

TITLE AND AUTHOR	MAIN FINDINGS	CATEGORIES DERIVED FROM SYNTHESIS				
		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
2. Effects of music on pain in patients with fibromyalgia (Alparslan *et al.*, 2016)	Music has an effect on the brain in different ways, resulting in a positive effect on both the neural function and hormonal systems. When patients are exposed to music, a decrease in complaints were noted, as well as an increase in patient relaxation, happiness, and competence feelings. Music has a positive effect on the physiological and psychological status, and the emotional and psychological responses are being effected by music as well			X		
3. Exclusive Breastfeeding in the Contexts of Socio-Cultural Challenges and Mothers' Health in Rural and Mixed Urban Areas of Ijebu, South Western Nigeria (Aluka-Arowolo & Adekoya, 2012)	Reasons cited for discontinuation of breastfeeding are malnutrition of the mother, poor maternal health, and partner's concern over body changes during breastfeeding.		X			

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
4. Music therapy for improving premature infants' wellbeing and communication skills and enhancing mother-infant bonding: a case study (Antonakopoulou, 2016)	Music interventions, such as lullabies, musical or vocal improvisation, songs and chants, in order to co-regulation procedure between the infant and mother, leading to a healthy relationship					X

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
5. The therapeutic use of music as experienced by cardiac surgery patients of an intensive care unit (Bhana & Botha, 2014)	The physiological effects of stress and anxiety are harmful to patients. Characteristic of music: slow, consistent and steady tempo music, with a predictable melodic, rhythmic and harmonic features promotes relaxation. Music reduces anxiety experienced by patients in an ICU set-up It is suggested that music secessions should be limited to 20 min or less, and each patient should be allowed to determine the length and time of the session Holistic care can be provide to patients with regular use of therapeutic music	X		X		X

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
6. Using music as a signal for biofeedback (Bergstrom *et al.*, 2014)	With the use of music over a long period of time, my result in the reduction of fatigue Participants should choose their own music, but from a databases where the characteristics of the music are chosen as low, relaxing music	X		X		X
7. Understanding the relationship between breastfeeding and postnatal depression: the role of pain and physical difficulties (Brown *et al.*, 2016)	Difficulties experienced with early breastfeeding and a short breastfeeding duration resulted in higher depression scores Pain related to breastfeeding were cited as the main reason for early cessation of breastfeeding		X			

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
8. Delayed onset lactogenesis II predicts the cessation of any or exclusive breastfeeding (Brownell *et al.*, 2012)	Women who experience DLII may be more prone to cessation of breastfeeding 4 weeks post-partum Women who experience DLII may benefit from early post-partum breastfeeding support interventions Definition of DLII: When a delayed in lactogenesis II occurs more than 72h post-partum, where lactogenesis II is the onset of copious milk secretion		X			

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
9. Impact of birth complications on breastfeeding duration: an internet survey (Brown & Jordan, 2013)	Complications during birth leads to shorter breastfeeding duration An increase in physiological breastfeeding difficulties were noted which can be linked to analgesic usage during the post-partum period Mothers who experienced a complicated birth, with a high pain score, should receive extra post-partum care to ensure a better breastfeeding outcome		X			
10. Effects of Music Engagement on Responses to Painful Stimulation (Bradshaw *et al.*, 2012)	Engaging activities that draw on the same processing pathways as pain, can reduce pain by creating competing construction pathways and constructions of reality, reducing the pain experienced			X		

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
11. The neurochemistry of music (Chanda & Levitin, 2013)		X			X	
12. Maternal perceptions of breastfeeding difficulty after caesarean section with regional anaesthesia: A qualitative study (Chaplin *et al.*, 2016)	Reasons cited for women experiencing difficulties with breastfeeding: emotional and physical effects of the delivery and anaesthetic; lack of skin-to-skin; separation of mother and baby; unnecessary formula supplementation; mother having feelings of failure		X			
13. Breastfeeding difficulties and supports and risk of postpartum depression in a cohort of women who have given birth in Calgary: a prospective cohort study (Chaput *et al.*, 2016)	87.3 % of breastfeeding women experience difficulty in breastfeeding during the first six months postpartum. Breastfeeding difficulties were connected with an increase in postpartum depression		X			

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
14. Fifteen-minute music intervention reduces pre-radiotherapy anxiety in oncology patients (Chen *et al.*, 2013)	Anxiety levels in oncology patients were decreased when exposed to music therapy prior to medical procedures. This decrease in anxiety levels, could also be seen in a decrease in heart rate and respiratory rate. Characteristics of music used: soft, melodic music at a low volume, with consistent tempo and dynamics, 60 – 80 beats per minute	X				X
15. Effects of music therapy on perception of stress, relaxation, mood, and side effects in patients on a solid organ transplant unit: A randomized effectiveness study (Crawford *et al.*, 2013)	Music were used as an effective psychosocial intervention in order to lower stress experienced by participants More reports of relaxation and experienced an uplifting mood					X

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
16. Predictors of Breastfeeding Duration among Women in Kuwait: Results of a Prospective Cohort Study (Dashti *et al.*, 2014)	2 % of infants were fully breastfed at 26 weeks postpartum, with 39 % receiving some human milk Positive influences on breastfeeding duration: level of maternal education, higher parity, infant being demand fed in hospital, preference for breastfeeding on the part of the infant's father and maternal grandmother Negative influences on breastfeeding: introducing a pacifier before four weeks of infant's life, mother returning to work before six months postpartum		X			
17. Complementary and alternative therapies to relieve labor pain: A comparative study between music therapy and Hoku point ice massage (Dehcheshmeh & Rafiei, 2015)	Music is an effective method for pain relieve, which is inexpensive, with no side effects for mother or infant			X		

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
18. The role of psychosocial factors in exclusive breastfeeding to six months postpartum (de Jager *et al.*, 2014)	Positive influences on breastfeeding success and duration thereof: higher intention to ebf, breastfeeding self-efficacy, comfort breastfeeding in public, perceived physical strength, reported less perceived breastfeeding difficulties		X			

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
19. Commitment and capacity for the support of breastfeeding in South Africa: a paediatric food-based dietary guideline (Du Plessis & Pereira, 2013)	Breastfeeding practices remain unsatisfactory in South Africa Breastfeeding initiation rates are 88 % in South Africa, but only 8 – 25 % ebf at six months postpartum 70 % of infants will be mix fed, or/and received solids before six months Reasons for discontinuation breastfeeding in South Africa: higher social-economic areas chose to formula feed after birth, lack of breastfeeding knowledge or experience, the absence of public facilities within which to breastfeed, fathers' involvement, working mothers, HIV epidemic		X			

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
20. Breastfeeding in South Africa: are we making progress? (Du Plessis, 2016)	Breastfeeding rates in sub-Saharan Africa indicated that only 32.04 % of infants were breastfed at six months of age. More protection, promotion and support for breastfeeding are required in South Africa to be in line with the WHO goals, the sustainable developmental goals		X			
21. Prediction of Duration of Breastfeeding among Migrant and Canadian-Born Women: Results from a Multi-Center Study (Dennis *et al.*, 2013)	Reasons for discontinue breastfeeding: - Maternal age younger than 20 years - No previous breastfeeding experience - Less than six months of breastfeeding duration of peers - Planned duration less than six months - Early experiencing of breastfeeding difficulties during the first week postpartum		X			

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
22. Time to initiation of breastfeeding and neonatal mortality and morbidity: a systematic review (Debes *et al.*, 2013)	Early breastfeeding initiation were described as breastfeeding within the first 24 hours after birth. Early breastfeeding can improve neonatal outcome and should be recommended as standard practice		X			
23. The psychoneuroimmunological effects of music: A systematic review and a new model (Fancourt *et al.*, 2014)	Relaxing recorded music reduces cortisol levels leading to a positive effect on the psychoneuroimmunological response. The exposure to relaxing recorded music triggers a chain of reaction that result in a decrease in sympathetic activity, as evident in lower respiratory rate and blood flow.				X	X

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
24. Breastfeeding and postpartum depression: state of the art review (Figueiredo *et al.*, 2013)	Breastfeeding cessation can be caused by pregnancy depression		X			
25. UK women's experiences of breastfeeding and additional breastfeeding support: a qualitative study of Baby Café services (Fox *et al.*, 2015)	Breastfeeding women cited idealistic prenatal expectations as a reason for feeling unprepared and overwhelmed, which led to early cessation of breastfeeding. Another reason were the lack of quality pre- and postnatal care given to breastfeeding women		X			
26. Effects of music therapy on positive and negative affect and pain with hospitalized patients recovering from a blood and marrow transplant: A randomized effectiveness study (Fredenburg & Silverman, 2014)	Live music chosen by the participants, had a positive effect on the pain management.			X		

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27. Labor Epidural Analgesia and Breastfeeding: A Systematic Review (French *et al.*, 2016)	High dose epidural fentanyl that are used during labor can result in early discontinuation of breastfeeding (before six weeks postpartum).		X			
28. Does circadian disruption play a role in the metabolic–hormonal link to delayed lactogenesis II? (Fu et al., 2015)	Mothers who experience breastfeeding difficulty within the first two week postpartum were identified to be prone to discontinue breastfeeding		X			
29. The Effect of Music on the Production of Neurotransmitters, Hormones, Cytokines, and Peptides: A Review (Gangrade, 2012)	Listening to relaxing music caused a change in cortisol levels, where no change in cortisol levels were seen when listening to self-selected music. Music trigger positive emotions, relieve stress and alleviate immune function	X			X	

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
30. Maternal Perceptions of Insufficient Milk Supply in Breastfeeding (Gatti, 2008)	35 % of women who stopped breastfeeding during the first few weeks postpartum, reported the reason as perceived insufficient milk supply		X			
31. Preterm birth: Strategies for establishing adequate milk production and successful lactation (Geddes et al., 2013)	Strategies to enhance human milk production for mothers with infant in nicu include early, frequent and simultaneous expression of milk combined with breast massage, as well as the reduction of stress					X
32. Music can effectively reduce pain perception in women rather than men (Ghaffaripour et al., 2013)	Personal preferred music was more powerful in distraction attention from pain. These preferred music had emotional and memorial engagements with individuals' found memories and therefore more powerful in diverting attention away from pain	X		X		

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
33. Factor impeding exclusive breastfeeding in a low-income area of the Western Cape province of South Africa (Goosen et al., 2014)	Breastfeeding difficulties experience by South African mothers: - Perception that infants need extra additional water - Perception that human milk alone is not enough feeding value - Inadequate infant feeding education and support by health departments - No community based breastfeeding support - Mother being separated from infant - Convention and family influence		X			
34. Music Therapy Reduces Pain in Palliative Care Patients: A Randomized Controlled Trial (Gutgsell et al., 2013)	Pain experience can be reduced in palliative care when exposed to relaxing music					X

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
35. 'It's those first few weeks': Women's views about breastfeeding support in an Australian outer metropolitan region (Hall et al., 2014)	Breastfeeding outcome can improve by identifying and solving early breastfeeding problems during the immediate postpartum (0 – 4 days of infant life) and medium postpartum (4 days – 8 weeks) period. Reasons for discontinue breastfeeding during the immediate postpartum period (72 % of all mothers discontinue breastfeeding before six months of infant age) - Perceived insufficient milk supply - Breastfeeding difficulties - Baby not gaining enough weight		X			

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
36. The impact of caesarean section on breastfeeding initiation, duration and difficulties in the first four months postpartum (Hobbs et al., 2016)	Initiation of breastfeeding failed in women who had an emergency caesarean section. In comparison with women who had a scheduled caesarean section or normal birth vs women who had an emergency caesarean section, the exclusive breastfeeding rate were low in women who had an emergency caesarean section		X			
37. Music as an aid for postoperative recovery in adults: a systematic review and meta-analysis (Hole et al., 2015)	Personal preference of music had the same effect of music chosen by the researcher Music reduces the experience of post-operative pain			X		
38. Cochrane corner: Music to reduce stress and anxiety for people with coronary heart disease (Holt, 2014)	Music listening resulted in lower anxiety experienced Preferred selected music played a greater role in anxiety reducing effects					X

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
39. Investigating the effect of music on labor pain and progress in the active stage of first labor (Hosseini et al., 2013)	Women in active labour experienced a decrease in pain when listening to music Music listening during labour increases tolerance of pain, and decrease anxiety with a shorter labour duration			X		
40. Well-Loved Music Robustly Relieves Pain: A Randomized, Controlled Trial (Hsieh et al., 2014)	Self-preferred music with specific meaning to the participant, could have activated the dopaminergic pleasure centres and specifically the nucleus accumbens, implicated within analgesia as well. These reward pathways could then have interacted at many levels with the opioidergic system to mediate analgesia			X		

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
41. The effects of listening to preferred music on pain intensity after open heart surgery (Jafari *et al.*, 2012)	Music can be effective as a non-pharmacological, inexpensive, non-invasive and side-effect free method for pain management			X		
42. Impact of Music Therapy on Breast Milk Secretion in Mothers of Premature Newborn (Jayamala *et al.*, 2015)	Listening to music improves the physical, emotional and spiritual well-being Listening to music reduces anxiety experience and increase the toleration of pain			X		X
43. The effects of sedative and stimulative music on stress reduction depend on music preference (Jiang *et al.*, 2013)	The use of sedative music had a lowering effect on the tension levels, with a further reduction when preferred sedative music was used	X				X

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
44. When Breast Milk Alone Is Not Enough: Barriers to Breastfeeding Continuation among Overweight and Obese Mothers (Kair & Colaizy, 2016)	Reasons for discontinue of breastfeeding: - Insufficient milk supply - Infant not satisfy with human milk alone - Experiencing breastfeeding difficulty		X			
45. Barriers to breast-feeding in obese women: A qualitative exploration (Keely *et al.*, 2015)	Reasons for difficulty in breastfeeding: - Birth complications - Lack of privacy - Low uptake of specialist breastfeeding support		X			

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
46. Brain correlates of music-evoked emotions (Koelsch & Jäncke, 2015)	Definition of music: structured sounds that are produced by humans as a means of social interaction, expression, diversion or evocation of emotions. Music can evoke changes in activity in the core structures underlying emotions This can lead to a rise in autonomic and endocrine responses as well as to motoric expression of music	X			X	
47. The Effects of Music Therapy on Pain in Patients with Neuropathic Pain (Korhan *et al.*, 2014)	Pain intensity were reduced with listening to music with a lower pain score. A decrease in the amount of analgesia used were also reported			X		

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48. Incidence and determinants of postpartum depression among healthy pregnant women and high-risk pregnant women (Kossakowska, 2016)	Postpartum depression are linked with a feeling of failure in breastfeeding 20 % of all mothers world-wide suffer from postpartum depression in the first three months postpartum		X			X
49. Effect of Music Therapy on Pain and Anxiety Levels of Cancer Patients: A Pilot Study (Krishnaswamy & Nair, 2016)	Pain score were lower when listening to preferred music	X		X		

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
50. Breast pain in lactating mothers (Leung, 2016)	Reasons for pain during breastfeeding: - Blocked ducts was the most common reason given - Breast pain can lead to early cessation of breastfeeding Painful and cracked nipples were given as reason for cessation			X		
51. Preoperative music intervention for patients undergoing caesarean delivery (Li & Dong, 2012)	- Preoperative music intervention can reduces anxiety and pain in women undergoing caesarean section - Caesarean deliveries causes major psychological stress, which can stimulate the sympathetic-adrenal system			X		X

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
52. Music listening as a means of stress reduction in daily life (Linnemann *et al.*, 2015)	- Music reduces stress in daily life, and energizing music increases and relaxing music decreases alpha-amylase activity					X
53. Music's Use for Anesthesia and Analgesia (Matsota *et al.*, 2013)						
54. Exploring the mother's perception of latching difficulty in the first days after birth: An interview study in an Italian hospital (Mauri *et al.*, 2012)	Latching difficulties are related to specific physical problem such as nipple pain, and nipple abnormal conformation		X			

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
55. Nipple Pain during Breastfeeding with or without Visible Trauma (McClellan *et al.*, 2012)	Nipple pain is a major cause of breastfeeding discontinuation. Nipple pain interfered with general activity, mood and stress in women with and without visible nipple trauma		X			
56. Improving breastfeeding rates in an ‘‘at risk’’ population (Mellor *et al.*, 2013)	Only 15 % of infant was still exclusively breastfeeding at six months postpartum Postpartum depression is a risk factor in obese women which also leads to early cessation of breastfeeding		X			
57. Effects of Listening to Music versus Environmental Sounds in Passive and Active Situations on Levels of Pain and Fatigue in Fibromyalgia (Mercadíe *et al.*, 2015)	Music may improve sleep quality Music reduces patients’ experience of pain with a subsequent decrease in analgesia exposure			X		

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
58. Music therapy, a review of the potential therapeutic benefits for the 59. critically ill (Mofredj *et al.*, 2016)	Music can decrease anxiety and increase an overall relaxation response without the use of medication					X
60. Breastfeeding Practices During the First Month Postpartum and Associated Factors: Impact on Breastfeeding Survival (Mortazavi *et al.*, 2015)	A higher rate of discontinue breastfeeding occurs during the first week postpartum, that any other time during the breastfeeding journey			X		
61. Overcoming Clinical Barriers to Exclusive Breastfeeding (Neifert & Bunik, 2013)	Reasons for discontinue breastfeeding: - Lack of breastfeeding information - Inadequate clinical knowledge and support		X			

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
62. Reasons for Earlier Than Desired Cessation of Breastfeeding (Odom *et al.*, 2013)	60 % of mothers discontinue breastfeeding earlier that desired Reasons for discontinue breastfeeding: - Difficult in latching - Infant nutrition and not gaining weight - Illness or need to take medication - Effort associated with expressing human milk		X			
63. A survey on difficulties and desires of breast-feeding women in Wuhan, China (Ouyang *et al.*, 2016)	Reasons for breastfeeding difficulty: - Breast problems - Mothers being too tired to breastfeed - Perception of time consuming - Breastfeeding being more difficult than perceived		X			

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
64. Music Therapy, Emotions and the Heart: a pilot study (Raglio *et al.*, 2012)	An interaction between the changes in physiological and psychological parameter can be seen in response to music therapy. Specifically, most of the individuals showed a reduction in heart rate during music therapy sessions					X
65. The Reasons for Early Weaning, Perceived Insufficient Breast Milk, and Maternal Dissatisfaction: Comparative Studies in Two Belgian Regions (Robert *et al.*, 2014)	50 % of mothers are dissatisfied with the duration of breastfeeding. Perceived insufficient milk and returning to work were the two mostly cited as reasons for discontinue breastfeeding		X			

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
66. Breast-feeding Continuation in South-Eastern of Iran: the Associated Factors (Roostaee *et al.*, 2015)	Reasons for discontinue breastfeeding: - Infant illness - Mothers' consciousness - Parental support - Practical breastfeeding training to mother - Mothers' educational level - Child's gender - Place of birth - Perceived insufficient milk		X			
67. Self-Reported Reasons for Breastfeeding Cessation among Low-Income Women Enrolled in a Peer Counseling Breastfeeding Support Program (Rozga *et al.*, 2015)	Reasons for discontinue breastfeeding: - 39 % due to mother's preference - 21 % due to perceived insufficient milk		X			

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
68. A Comparison of Maternal Attitudes to Breastfeeding in Public and the Association with Breastfeeding Duration in Four European Countries: Results of a Cohort Study (Scott *et al.*, 2015)	Mothers who had a negative attitude toward breastfeeding in public, were less likely to have ever breastfed in public and were prone to early cessation of breastfeeding		X			
69. Effect of music therapy during vaginal delivery on postpartum pain relief and mental health (Simavli *et al.*, 2014)	Mothers who received music therapy had a lower levels of postpartum pain and anxiety than those who did not receive music therapy. On days one and eight the difference in the control group and experimental group (were one received music therapy as an intervention and the other did not) could be seen were the satisfaction rate and postpartum depression rate were lower with the experimental group		X	X		X

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
72. Factors contributing to early breast-feeding cessation among Chinese mothers: An exploratory study (Tarrant *et al.*, 2014)	Postnatal support would increase mother's confidence and enhance her motherly experience. Factors identified as reasons for discontinuation of breastfeeding: - Unnatural expectations - Mothers left to figure breastfeeding out - Uncertain regarding breastfeeding - Unfulfilling breastfeeding experience - Guild vs relief		X			
73. The Effect of Music on the Human Stress Response (Thoma *et al.*, 2013)	Music listening has been suggested to beneficially impact health via stress-reducing effects. Music listening impacted the psychobiological stress system.					X

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		CHARACTERIS-TICS OF MUSIC	BREASTFEEDING DIFFICULTIES	MUSIC AND PAIN	MUSIC AND HORMONES	MUSIC AND STRESS
74. Barriers to Exclusive Breastfeeding Among Mothers During the First Four Weeks Postpartum (Thomas, 2016)	Reasons for difficulty in breastfeeding: - Perceived insufficient milk - Sore of painful nipples - Return to work or school - Poor latching		X			
75. Effects of music therapy on pain and anxiety in patients undergoing port catheter placement procedures (Zengin *et al.*, 2013)	Exposure to music led to a significant reduction in pain and anxiety scores During invasive medical procedures, music interventions led to a decrease in stress hormone levels as well as physiological parameters. Physiological parameters are heart rate, respiratory rate, systolic blood pressure and diastolic blood pressure			X		X

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ANNEXURE G – AUTHOR'S GUIDELINES FOR JOURNAL OF HUMAN LACTATION (2017)

Manuscript Submission Guidelines: *Journal of Human Lactation*

Submit all *JHL* articles to: http://mc.manuscriptcentral.com/jhl

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JHL Publishing Policies

Manuscripts should be prepared according to the guidelines set forth in the *American Psychological Association Manual of Style,* 6th Edition (VandebBos, 2010). This applies to all headings within the text, pagination, running head, in-text citations, reference list, tables and figures, along with statistical notations, punctuation and word usage. All text should be double-spaced, size 12 pt. font. Margins should be set at 1 inch. **Do not include page or line numbers**, as these will automatically be added when the manuscript is submitted and converted to a PDF file.

Language preferences

Acceptable American English usage and syntax are expected. Do not use slang, medical jargon, or obscure abbreviations or phrasing. Adherence to the *ILCA Style Guidelines for Written Professional Resources* (*ILCA* Professional Resources Committee, 2016) for preferred language is required (see Appendix B). For example, **human milk or mother's milk is correct, rather than breast milk and is written as two words, breastfeeding is one word**. Participants in research studies need to be referred to as participants or respondents, never subjects.

Metric measurement is preferred; equivalent measurements may be included in parentheses. Always provide the complete form of an acronym/abbreviation the first time it is presented in the text. Use generic names for drugs or devices; put trade names in parentheses.

Resources for authors whose native language is not English are:

- Sage offers English Language Editing services: http://languageservices.sagepub.com/en/
- For non-Native English writers: *Author Aid*: http://www.authoraid.info/en/
- For novice writers: University of Utah's *Journal Writing*:

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Peer review policy

All manuscripts are reviewed initially by the Editors and only those papers that meet the scientific and editorial standards of the journal, and fit within the aims and scope of the journal, will be sent for outside review. Each manuscript is reviewed by at least **three** referees. All manuscripts are reviewed as rapidly as possible, and an editorial decision is generally reached within eight weeks of submission. *JHL* operates a conventional double-blind reviewing policy in which the reviewers' and authors' names are always concealed.

Ethical Publishing Policies

Avoiding Plagiarism

Plagiarism is a serious breach of ethical scholarship. To avoid this possibility, we use a software program (*iThenticate*) to check all manuscripts for plagiarism. It is important that authors understand the importance of using quotes with appropriate in text citations including page numbers when using the written words of other authors. Failure to do so constitutes plagiarism.

Avoiding Referencing Predatory Journals

Over the past 5 years there has been a spread of unethical publishing practices that use an exploitative business model, which charges authors and provides none of the editorial services and quality control measures provided by legitimate journals. Several organizations concerned with ethics in publishing "have collaborated in an effort to identify principles of transparency and best practice that set apart legitimate journals and publishers from non-legitimate ones and to clarify these principles" (Redhead, 2013, p. 1). They have published the *Principles of Transparency and Best Practices in Publishing* (Redhead, 2013). In accordance with these

publishing standards, we will **not** publish references from any known predatory journal. ***We require all authors submitting manuscripts to carefully check their references and delete any found to be from predatory journals.*** For more information about these journals and publishers see: https://scholarlyoa.com/2016/01/05/bealls-list-of-predatory-publishers-2016/

Protection of Human Rights

We accept manuscripts for publication only if it is made clear that investigations were carried out using a high ethical standard. ***Evidence of protection of human subjects approval from an appropriately credentialed Institutional Review Board is required for all research manuscripts submitted*** (including case studies), with the exception of literature reviews. The specifics about how informed consent was obtained should be described in the Data Collection section of the submitted manuscript. All experimental studies must conform to the *Declaration of Helsinki* (World Medical Association, 2001). Authors are required to ensure the following guidelines are followed, as per the *International Committee of Medical Journal Editors* Recommendations (Fees, 2015). Participants have a right to privacy, which should not be infringed upon without their informed consent. Identifying information, including patients' names, initials, or hospital numbers should not be published in written descriptions, photographs, or pedigrees unless the information is essential for scientific purposes and the participant (or parent or guardian) has given written informed consent for publication. Informed consent in this situation requires that an identifiable participant be shown the manuscript and provide consent prior to submission.

Identifying details should be omitted if they are not essential. Complete anonymity is difficult to achieve; therefore, informed consent should be obtained if there is any doubt. For example, masking the eye region in photographs of participants is inadequate protection of

anonymity. If identifying characteristics are altered to protect anonymity (e.g., in genetic pedigrees) authors should provide assurance that alterations do not distort scientific meaning.

Authorship

Manuscripts should be submitted for consideration after all contributing authors give consent. Authors submitting papers should carefully check that all the information about contributing authors is correct and complete. The list of authors should include all those who can legitimately claim authorship. This is all those who (a) made a substantial contribution to the concept and design, acquisition of data or analysis and interpretation of data; (b) drafted the article or revised it critically for important intellectual content; **and** (c) approved the submitted version. When a large, multicenter group has conducted the work, the group should identify the individuals who accept direct responsibility for the manuscript and who meet the listed criteria; only these individuals should be listed as authors. Acquisition of funding, collection of data, or general supervision of the research group alone does not constitute authorship, although all contributors who do not meet the criteria for authorship should be listed in the Acknowledgments section. Please refer to the *International Committee of Medical Journal Editors* (ICMJE) *Authorship Guidelines* (Fees, 2015): http://www.icmje.org/recommendations/browse/roles-and-responsibilities/defining-the-role-of-authors-and-contributors.html

Manuscript Format

Title page

All submissions require a Title Page. This is the only file that should include the authors' names. The Title Page must be uploaded as a separate file to ensure blind peer-review. The Title Page needs to include: (a) Complete manuscript title; (b) Authors' full names, academic

degrees, and affiliations; (c) Corresponding author's name, address, telephone number, and e-mail address; and (d) Acknowledgments, if the authors wish to include them. All contributors who do not meet the criteria for authorship should be listed in the 'Acknowledgements' section. Examples of those who might be acknowledged include a person who provided purely technical help, writing assistance, or a department chair that provided only general support. Authors should disclose whether they had any writing assistance and identify the entity that paid for this assistance**.** In addition, authors may acknowledge persons who have contributed to the research or manuscript development. Participants may be acknowledged, but participants must not be specifically named. For example, thank you to all the families that participated in this research. Limit acknowledgments to 50 words.

Please refer to the information and guidance on how best to title your article, write your article and abstract by visiting SAGE's *Journal Author Gateway Guidelines on How to Help Readers Find Your Article* online: https://us.sagepub.com/en-us/nam/help-readers-find-your-article

Abstract

Abstracts are required for all research manuscripts, with the exceptions of case studies. A structured abstract of no more than 250 words is required. Content about each of the following with **these** bolded headings is required: (1) Background, (2) Research Aim/question(s), (3) Methods, (4) Results, and (5) Conclusion(s). Abstracts do not count in the manuscript word count. Non- research manuscripts (e.g., Insights into Practice, Insights into Policy, etc.) do not need abstracts. Do **not** use abbreviations in the abstract. Randomized Clinical Trials must also include the following statement following the abstract: "This RCT was registered (registration number here) with [name site] on [date]."

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Keywords

Keywords should only be entered into ScholarOne and not included in the main manuscript file. Authors need to choose keywords from the list of appropriate words in Appendix B, which are entered into the mandatory keyword list in *ScholarOne*. Optional additional MeSH (US National Library of Medicine's Medical Subject Headings) keywords, may be listed in the optional keyword box. You can submit your abstract to *MeSH on Demand* (https://www.nlm.nih.gov/mesh/MeSHonDemand.html), which will identify and provide you a list of MeSH keywords appropriate for your manuscript. You can check to see if your selected keywords are MeSH terms on their website: https://www.nlm.nih.gov/mesh/MBrowser.html

Key Messages

All Research manuscripts should include a separate file containing Key Messages. The .doc or .docx file should be uploaded separately from the manuscript under the "**Key Messages**" file designation. This list of 3-4 bullet points written in complete sentences without abbreviations should contain the following information:

- One statement about context of study (i.e., what is the gap in the knowledge base that is the rationale for doing this study?).
- 1-2 statements about the core findings of the study.
- One statement of the significance of the study (i.e., how does this research add to the existing knowledge base?).

Body of manuscript

The main manuscript file should be a Word document (.doc or. docx). Please do not submit images of tables embedded into the Word document, rather as separate .doc or .docx files. *Format your manuscript according to the specific type of manuscript you are submitting,*

as detailed below.

Funding Acknowledgement

JHL complies with the World Health Organization's (1981) *International Code for the Marketing of Breast milk Substitutes (the International Code)* by accepting no advertising by non-International Code compliant companies and by not publishing research funded by non-International Code compliant organizations. Additionally, to comply with the *Guidance for Research Funders, Authors and* Publishers issued by the *International Committee of Medical Journal Editors* (*ICMJE*; Fees, 2015), ***all authors are required to acknowledge their funding in a separate heading after the body of the text and before the reference list*** (see specific details below).

Declaration of conflicting interests

It is the editorial policy of *Journal of Human Lactation* to require a declaration of conflicting interests from all authors, enabling a statement to be carried within the paginated pages of all published articles. When making a declaration the disclosure information must be specific and include any financial relationship that any and all authors of the article has with any sponsoring organization and the for-profit interests the organization represents, and with any for-profit product discussed or implied in the text of the article.

Any commercial or financial involvements that might represent an appearance of a conflict of interest needs to be additionally disclosed in the cover letter accompanying your article to assist the Editor in evaluating whether sufficient disclosure has been made within the *Declaration of Conflicting Interests* provided. For more information please visit the SAGE *Journal Author Gateway.*

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References

All in-text citations and the reference list must be APA formatted. The Reference list is double-spaced in 12-point font. References need to be current, ***published within the past 5 years***, with the exception of classic works in the field. All in-text citations must be cited in the Reference list. For meta-analysis include all studies in the reference list with an asterisk next to those used in the analysis (APA, 2010, p. 183). Examples of APA formatted references are listed below. ***Please note the capitalization rules, complete titles of journals and the differences between different types of citations***.

Journal

Kamholz, K. L., Parker, M. G., & Philipp, B. L. (2012). Implementing change: Steps to initiate a human donor milk program in a US level III NICU. *Journal of Human Lactation*, *28*(2), 128-131.

Journal Article with DIO (for web-based materials)

Herbst-Damm, K. L., & Kulik, J. A. (2005). Volunteer support, marital status, and the survival times of terminally ill patients. *Health Psychology*, *24*, 225-229. doi: 10.1037/0278/6133.24.2.225

Book

Michaels, P. J., & Balling, R. C., Jr. (2000). *The Satanic Gases: Clearing the Air about Global Warming*. Washington, DC: Cato Institute.

Website

United States Environmental Protection Agency. (2016). *Climate Change*. Retrieved from the Environmental Protection Agency website: http://www.epa.gov/climatechange

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Tables

Format all tables according to APA format (APA, 2010, p. 193), including the use of statistical abbreviations and footnoting (see Appendix D for examples). Tables, graphs and charts should be in Word format.

Figures

Photographs/Figures **should not** be copied into a Word or PowerPoint document; they should be provided in their original format (.jpg, .tiff, .eps). For photographs, please ensure that they are high-resolution (at least 300 dpi). Titles and legends should follow APA formatting (APA, 2010, p. 150).

Manuscript Types

JHL accepts various types of research manuscripts (i.e., case reports, original and student research, brief research reports and literature reviews). In addition, we also accept non-research manuscripts with lactation relevant content of interest to clinicians and researchers (i.e., Insights into Practice, Insight into Policy, Letters to the Editor and their responses). Each category has specific organizational and formatting requirements that are listed below.

Research Manuscripts

JHL is a multi-disciplinary international journal with a diverse readership. It is therefore essential that authors clearly explain their research methods, data analysis process and their results in a way that can be understood by professionals in other disciplines. *JHL* welcome manuscripts from all disciplines and methodologies. In all research manuscripts include the following:

1. **Background**

   Should succinctly summarize the literature with regard to the study aims/research

question(s). This includes the gap in the literature addressed by the research aim(s), which need to be clear, along with a succinct statement of the significance of the study. ***The study aims need to be clearly and explicitly stated at the end of the Background section*** (before the methods section).

5. **Methods:** All of the following sub-sections must be included
    a. Design: Clearly state the study design with a rationale; include protection of human subjects in this section.
    b. Setting: Provide an environmental context for the study, including the dates of data collection. Qualitative research needs to have a more in-depth contextualization than does quantitative research.
    c. Sample: Identify the target population and the sample population, include participant selection criteria, inclusion and exclusion criteria, method of sampling, and sample size rationale with power analysis, if applicable. Refer to study participants, as participants or respondents, not subjects. Include a PRISMA diagram, as needed to clarify how your sample was obtained.
    d. Measurement (if applicable): Clearly define each variable and how it has been measured, providing information on the reliability and validity of all instruments. If survey methods are used, provide enough information on these tools to inform readers about the appropriateness of their use within your specific population.
    f. Data collection: Describe who, how and when data were collected. This includes how informed consent was obtained, if applicable.
    g. Data analysis: The data analysis plan for each research aim/question should be addressed separately in this section. This section should include any relevant

information about decisions to group individual variables in to indices or scales and how these new constructs were evaluated. The analysis plan should describe rationale for selection of statistical tests or why the test are appropriate to address both the study question and the level of measurement. When multivariate modeling is applied, the analysis plan should include a description of the modeling procedures, including how variables were entered and evaluated and the criteria by which the final models shown in the results were determined. In most cases, 95% confidence intervals are preferred over the *p*-value for evaluating statistical significance. In the case of *p*-values, the analysis plan should state if values shown are one or two tailed.

6. Results

Structure this section according to each of the research aims/questions. It is appropriate to summarize findings displayed in table(s) and/or highlight key findings; however, avoid repeating most findings displayed in tables.

a. Quantitative results:

- Follow table guidelines for all tables, including APA formatting (APA. 2010, p. 119-120), including statistical notations (i.e., N=total sample; n=number of cases in a subsample).
- Use metric measurement
- The inclusion of *p*-values is unnecessary when 95% confidence intervals are presented. As appropriate, identify and specify units of measurement (metric measures are preferred). Do not use excess precision in expressing results. In most cases two decimal places is sufficient.
- Presentation of the results from logistic regression, Poisson regression, or Cox

regression should be the exponentiated parameter estimate or measure of effect (i.e., the odds ratio, incidence rate ratio, or hazard ratio) and corresponding 95% confidence interval rather than the parameter estimate. Indicators of the goodness of fit of the model, such as a model log likelihood ratio for logistic regression, should be included.

- All randomized controlled trials submitted for publication should include a completed *Consolidated Standards of Reporting Trials* (CONSORT) flow chart. Please refer to the CONSORT statement website at http://www.consort-statement.org for more information.
- **We require authors to register their clinical trials** at http://clinicaltrials.gov or other suitable databases identified by the *International Committee of Medical Journal Editors*. The *WHO International Clinical Trials Portal* (WHO, 2014) currently lists 15 acceptable registries. Pilot studies or secondary analyses will not require registration; however, the parent study registration for all secondary analyses should be documented. You will need to specify the registration number in ScholarOne and in the required statement following the abstract ("The RCT was registered (registration number here) with [name site] on [date].")

b. Qualitative results:

- Many disciplines conduct qualitative studies; therefore, there are many appropriate ways to report study results. Because *JHL* is a multi-disciplinary international journal and we have a diverse readership, it is the responsibility of the author(s) to clearly explain their analysis process and their results.
- Although there are many ways to conduct qualitative research, commonalities do

exist. O'Brien and colleagues (2014) analyzed these commonalities. These researchers "formulated and defined standards for reporting qualitative research while preserving the requisite flexibility to accommodate various paradigms, approaches, and methods" (p.1245). ***JHL adheres to their guidelines in reviewing qualitative manuscripts and recommends authors use these guidelines when developing their manuscripts with the understanding that not all of these standards are applicable to every qualitative methodology.***

4. **Discussion:** The purposes of this section are to:
    - Establish the ways the researchers have addressed their research questions;
    - Provide alternative possible explanations for the current findings;
    - Compare the current study findings with the previously reported research;
    - Identify areas that need further study;
    - Suggest possible applications to lactation practice.

    a. Limitations: Describe study limitations due to design and operationalization in a separate sub-section of the Discussion section with a section heading.

4. **Conclusion**

Summarize the results with several broad statements and the discussion with several general statements. Although the content for the manuscript text should include all of the components listed, there may be some variation depending on the research methodology used. For example, it would be inappropriate to have a measurement section within a qualitative research manuscript.

Types of Research Manuscripts: Specific Guidelines

Additional guidelines for specific types of research studies are listed below. Word

limits are adhered to generally; however, *if your manuscript is longer than the recommended length, please query the editor and we may be able to be flexible depending on the situation.*

Case Reports

The manuscript has a word limit of 1500 words, excluding tables, figures, and references. Include headers and content for just the following sections:

a. Background: A brief introduction, including a review of the literature relating to the problem.
b. Case: The case presentation, including informed consent, history of the problem and other pertinent information, clinical approach, and outcome.
c. Discussion: Discussion/recommendations regarding future investigations and/or assistance of future clients.
d. Conclusion: Client confidentiality must be protected in the presentation, and if identifiable photos are used, a statement regarding obtaining written consent must be included (see Photographs section above). Tables should be kept to a minimum.

Original Research

The manuscript has a word limit of 3500 words for quantitative manuscripts and 4000 words for qualitative manuscripts; however, exceptions may be made with the Editor in Chief's prior approval. Include all the research components in this type of manuscript.

Brief Original Research Reports

Brief reports on new, interesting findings will meet the same criteria as Original Research; however, need to be reported in shorter format reflecting a less complex study design or original findings not requiring an extended manuscript. The manuscript has a 2000 word limit, excluding tables, figures, and references; limit to 1 table and 1 figure.

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Manuscripts should be formatted using all the components of research articles, including Key Messages (see above).

Student Research

Students currently enrolled in a degree-seeking program may submit Original Research and Brief Original Reports by following the requirements above (see Original Research and Brief Original Reports sections). We seek to foster an interest in the field and in early career development, by dedicating space to student-led research. Student Research manuscripts will undergo the same blinded, external peer-review process as other manuscripts. It is expected the student will be the first-author on the manuscript and has had a significant contribution to at least two of the following areas: Study design and concept, implementation, data collection, statistical analysis and interpretation, or drafting of the manuscript. *On the title page, please include 1-2 sentences describing the student's current situation* i.e., the course/program where the student is currently matriculated.

Literature Review

Literature reviews critically analyzing relevant lactation specific topics, which use an established review methodology, are welcomed. Many different ways of conducting literature reviews exist; however, commonalities do exist across these different methodologies, which include a rigorous identifiable methodology. Although *JHL* accepts all types of reviews (e.g., integrated, systematic and other types of literature review manuscripts) we adhere to the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (PRISMA) guidelines for literature reviews (Moher, Liberati, Tetzlaff, Altman, & The PRISMA Group, 2009). We strongly urge authors to incorporate a PRISMA flow diagram of the identification, screening and inclusion of reviewed literature into their manuscript. The manuscript should be limited to 4000

words, excluding tables, figures, and references. Content should include all research manuscript components, as listed above.

Non-Research Manuscripts

Insights into Policy

This article category is designed to feature new steps in policymaking, for example, innovative policies on lactation-related hospital clinical practice, or steps forward in national or international policymaking (e.g., development of national guidelines for implementation of the *Baby-Friendly Hospital Initiative*). We also invite general discussion and contemporary insights about policymaking and ways in which policies can be changed or implemented. This type of manuscript has a word limit of 2000, excluding tables, figures, and references. The manuscript should include the following headings and content: (a) The background stating the issue/problem, (b) presentation of the recommendations, and (c) the conclusion.

Insights into Practice

Innovative teaching aids and procedures, charting, and referral forms specific to a lactation workup are appropriate for this article category. We also invite general discussions about running a lactation consultant practice, hospital-based management and service issues, and contemporary insights related to clinical experience.

The manuscript has a word limit of 2000 words excluding tables, figures, and references. The following headings and content should be included: (a) The background stating the issue/problem, (b) presentation of the recommendations, and (c) the conclusion.

Letters to the Editor

JHL readers are encouraged to exchange information or provide input related to an article published in the journal within the past three months or contributions to a controversy or debate by submitting a Letter to the Editor. Letters should not exceed 750 words (no abstract

required). Letters commenting on articles should reference the particular article. References should be kept to a minimum. In addition to including a title page (see Title Page section above), please include the following information in the Letter's main document: Authors' names, academic degrees, affiliation, city, state/province, country, and e-mail for correspondence. Letters to the Editor are not sent out for peer review.

Response to the Letter to the Editor

Authors of published manuscripts are given the opportunity to respond to a Letter to the Editor. These are invited manuscripts and should be no more than 750 words and contain no figures or tables. References should be kept to a minimum. In addition to including a title page (see Title Page section above), please include the following information in the Letter's main document: Authors' names, academic degrees, affiliation, city, state/province, country, and e-mail for correspondence. Letters to the Editor are not sent out for peer review.

Submitting Your Manuscript

***JHL* is hosted on SAGE Track; a web based online submission and peer review system.** Please read the Manuscript Submission guidelines below, and then visit https://mc.manuscriptcentral.com/jhl to login and submit your article online.

IMPORTANT: Please check whether you already have an account in the system before trying to create a new one. If you have reviewed or authored for the journal in the past year it is likely that you will have had an account created. If you are unable to access your account, please contact the *JHL* Editorial Office for assistance at jhlmanagingeditor@gmail.com. For further guidance on submitting your manuscript online please visit ScholarOne Online Help.

1. English language editing services

Authors who would like to refine the use of English in their manuscripts might consider

using the services of a professional English-language editing company. Visit SAGE *Language Services* on our *Journal Author Gateway* for further information.

2. File types

Only electronic files conforming to the journal's guidelines will be accepted. Preferred formats for the text and tables of your manuscript are Word doc, rtf, LaTeX files are also accepted. The text should be double-spaced throughout; 1 inch margins. Text should be standard 12-point sized font.

3. Artwork, figures and other graphics

Photographs

Photographer/copyright holder permission is required for the use of photographs or unique illustrations/images. If your manuscript is accepted for publication, you will be asked to have the photographer/copyright holder sign a *JHL* "Permission to Reprint Material" form. If the photographer is one of the authors on the article, no permission form is needed. If the photograph is recognizable (i.e., shows a face), you will also be asked to have the person in the photograph (or parent) sign a *JHL* consent form. Please include a statement in your manuscript indicating that written consent for using the photograph(s) was obtained.

Audio/Video Files

JHL is now accepting audio/video files. The following files types can be handled by our manuscript submission website, ScholarOne. Audio/Video: asf, avi, flv, mov, mp3, mp4, mpeg, mpg, wav, wma, wmv. For optimal viewing, videos should be 480x360 pixels. If it is a different size/aspect ratio, it will be resized upon upload. There is no limit to the length of the video, although the maximum file size allowed is 1GB. Videos hosted elsewhere (such as YouTube), can be included as links. Once uploaded, the videos will only be viewed in the

HTML version of an article.

Figures and Tables

Each table/figure/image must be uploaded as a separate file, not as part of the main text document. If there are multiple tables/figures/images, please upload each one as a separate file. Number tables/figures/images consecutively as referred to in the text. Provide each table/figure/image with a brief title above the table/figure/image. Place general explanatory matter in a note at the end of the table, labeled 'Note.'. A specific note referring to a particular column, row, or cell and are indicated by superscript lower case letters. (See the *APA Manual 6th Edition* for additional information.)

Figures

Submit all figures, images, and charts separately, in .tif, .jpeg, or .eps format, and in the highest resolution, at least 300 dpi. Include a brief and specific title at the top of all figures and images followed by a description (if applicable) at the bottom. Make titles and axis labels editable. Figures and images can be printed in color for a fee (online color reproduction is free). Contact your SAGE production editor for more information.

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5. Contributor's publishing agreement

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6. Submitting to PubMed Central

There are instructions on the *NIH* Website about how an author can post his or her paper (see Method C) at http://publicaccess.nih.gov/submit_process.htm. Additionally, SAGE has a program where an author can choose to pay the $3,000 SAGE Choice fee, and we will deposit on the author's behalf and make the article freely available immediately on publication.

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Please see more information about this option at https://us.sagepub.com/en-us/nam/sage-choice.

7. Open access and author archiving

For more information on the open access options for *JHL*, funding body compliance, and depositing your article in repositories, please visit SAGE Publishing Policies on our *Journal Author Gateway.*

8. Submitting additional material

This journal is able to host additional materials online (e.g. datasets, AV files) alongside the full-text of the article. These will be subjected to peer-review alongside the article. For more information please refer to SAGE's *Guidelines for Authors on Supplemental Files*. Please clearly label your supplementary material with the word "supplemental" in the file name.

On Acceptance and Publication

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After your article is received by production, the corresponding author will receive a notification with the Production Editor's contact information and a notice that the paper has begun copyediting. The author is kept aware of each stage of the production process.

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SAGE provides authors with online access to their final article. A link with the downloadable .pdf will be sent to the corresponding author.

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Online First allows final revision articles (completed articles in queue for assignment to an upcoming issue) to be published online prior to their inclusion in a final journal issue, which significantly reduces the lead-time between submission and publication. For more information

please visit SAGE *Online First Fact Sheet.*

Further information

Any correspondence, queries or additional requests for information on the manuscript submission process should be sent to the JHL editorial office as follows: jhlmanagingeditor@gmail.com.

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APPENDIX A

Author Submission Checklist

Meet this requirement?	Manuscript Requirement	Specific Instructions
☐ Yes ☐ No	**General format for all manuscripts**	Size 12 pt. font, double spaced, paragraphs indented, no additional spacing, .DOC or .docx file format, 1-inch margins, no line numbering, paginated, APA format.
☐ Yes ☐ No	**Title page (Separate file)**	All authors listed with academic degrees/titles and affiliations, corresponding author's contact information (including email), Acknowledgements (optional) 50 words max.
☐ Yes ☐ No	**Keywords**	Enter into the identified place in *ScholarOne.*
☐ Yes ☐ No	**Abstract**	Only for Research manuscripts (except Case Reports), structured with the following subheadings: Background, Research Aim/ Questions, Methods, Results, Conclusions, 250 words max. Do not include keywords here.
☐ Yes ☐ No	**Key Messages (Separate file)**	Uploaded as a separate .doc/.docx file under "Key Messages" file designation, 3-4 bullet points, no abbreviations.
☐ Yes ☐ No	**Body of the manuscript**	Adheres to word count limits and contains the appropriate headings for the specific manuscript type as outlined in the Author Guidelines, contains no author-identifying information.

Meet this requirement?	Manuscript Requirement	Specific Instructions
☐ Yes ☐ No	**Funding Statement**	Include a detailed funding statement at the end of the manuscript, before the References section. If no funding was received, please state "Funding: None."
☐ Yes ☐ No	**Conflict of Interest Statement**	Include at the end of the manuscript, before the References section. If no funding was received, please state "Conflicts of Interest: None."
☐ Yes ☐ No	**In-text citations & References**	All citations and references in APA format, Reference list is double-spaced and use current sources.
☐ Yes ☐ No	**Tables (Separate files)**	Adhere to all table guidelines as outline in Appendix C, numbered sequentially, in separate .DOC/.DOCX files, referenced in text.
☐ Yes ☐ No	**Figures (Separate files)**	Adhere to figure guidelines, in separate .JPEG, .TIF, or .EPS files, not embedded in manuscript, numbered sequentially, referenced in text.
☐ Yes ☐ No	**Revision**	Includes a point-by-point response to the reviewer's comments, no tracked changes or strike through, all changes highlighted or in colored text.

*__Please note__: If your manuscript does not meet one or more of these requirements, it will be unsubmitted until all requirements are met. This will delay the submission and possible review process.

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APPENDIX B

***ILCA* Preferred Lactation-Related Language (2016)**

Preferred Term	Instructions
antifungal	No hyphen
artificial nipple or bottle teat	Not bottle nipple
breastfeeding-friendly	Not capitalized when used generically
Baby-Friendly designated	Not "certified," no trademark
Baby-Friendly Hospital Initiative	BFHI After first use (all capitalized, no trademark)
birth weight	Two words
bottle feeding	As an adjective use "bottle-fed"
breast pump	Two words
breastfeeding	Not "nursing"
breast milk	Use of "human milk" is preferred; "mother's own milk" or "expressed milk" may be used
Candida infection (thrush)	If "candida infection" is used also use "thrush."
Cesarean birth or cesarean section	Lower case, not "C-section" and not spelled "caesarean"
cup feeding	As an adjective use "cup-fed"
dysphoric milk ejection reflex	d-MER after first use
expressing	Not "pumping"
expressed milk	Not "pumped milk"
finger feeding	As an adjective use "finger-fed"
formula-fed	Hyphenate adjectives
healthcare	One word

Preferred Term	Instructions
human milk	Preferred over "breast milk"
human milk substitute	Use of "formula" is acceptable; use "breast milk substitute (BMS)" only if part of a legal document; avoid "artificial baby milk"
IBCLC	Not "LC"
infant	Rather than "baby"
International Code of Marketing of Breast-milk Substitutes	Spell out in full when first mentioned), or International Code after first use (not "The Code" or "WHO Code")
JHL	(italicize)
lactation consultant	Lowercase; use of "International Board Certified Lactation Consultant® (IBCLC®)" is preferred
La Leche League	LLL after first use (not "the League")
latch	Not "attachment" or "latch-on" when used as a noun) (e.g., The baby had a good latch.)
late preterm infant	Not "near term infant"
lip-tie	Hyphenate
low birth weight	(noun) (e.g., Her second baby had a low birth weight.)
low-birth-weight	(adjective) (e.g., Low-birth-weight babies require closer observation.); use of "small for gestational age" is preferred
mastitis	Rather than "breast infection"
mother	Not "mom" or "mum"
mother-infant or mother-infant dyad	Not "mother-baby"
milk ejection	Not "letdown"
milk ejection reflex	MER after first use

Preferred Term	Instructions
milk expression	Not "pumping"
pacifier (dummy)	If "pacifier" is used, also use "dummy"
physician	Not "doctor"
plugged duct	Not "clogged duct"
preterm	Not "premature"
professional nurse or registered nurse	RN after first use (not "nurse")
relactation	No hyphen
rooming-in	Hyphenate
skin-to-skin	(adjective) (e.g., Skin-to-skin care is recommended for all newborns.)
skin to skin	(verb) (e.g., Her baby was put skin to skin shortly after the birth.)
small for gestational age	SGA after first use (preferred over "low-birth-weight")
syringe feeding	As an adjective use "syringe-fed"
tongue-tie	Hyphenate; or ankyloglossia
Web-based	Capital W; hyphenated
Website	lowercase; one word

APPENDIX C

JHL Approved Lactation Keywords (keywords are case sensitive)

Academy of Breastfeeding Medicine	breastfeeding support	lactation counseling
American Academy of Pediatrics	breastfeeding rates	lactation education
Breastfeeding Attrition Prediction Tool	breast health	lactation management
breastfeeding barriers	corporate lactation program	lactogenesis
breastfeeding benefits	co-sleeping	LATCH assessment tool
breastfeeding center	dysfunctional suck	*La Leche League*
breastfeeding cessation	human milk substitute	late preterm infant
breastfeeding difficulties	*Human Milk Banking Association of North America*	milk production
breastfeeding duration	insufficient milk supply	milk supply
breastfeeding experience	*International Board of Lactation Consultant Examiners* (*IBLCE*)	mother-to-child transmission
breastfeeding initiation	*International Code of Marketing of Breast-milk Substitutes*	nipple shield
breastfeeding knowledge	*International Lactation Consultant Association (ILCA)*	nipple vasospasms
breastfeeding outcomes	*Kangaroo Mother Care* (*KMC*)	prelacteal food
breastfeeding practices	lactational amenorrhea	relactation

breastfeeding promotion	lactation consultant	nipple trauma
nipple vasospasms	relactation	sucking difficulties
prelacteal food	nipple trauma	*Supplemental Nutrition Program for Women, Infants and Children* (*WIC*)

APPENDIX D

TABLE GUIDELINES

General Concepts Applying to All Tables

1. All tables need to be understood by a reader, without any knowledge of the manuscript. This means that all tables need to stand alone, as complete documents that are self- explanatory.
2. Each table can display only one type of statistic (i.e., do not put means (SD) in the same table as frequency distributions and/or Chi-squared. These are apples and oranges, never to be grouped into the same table).
3. Results displayed in tables are not presented again in the text; rather refer the reader to the table. You may draw the readers' attention to a particularly important finding within the table, if necessary (usually it is not necessary).
4. Tables need to be numbered sequentially according to when they are first referenced in the text. Number tables using Arabic numerals (1,2, etc.).
5. Brief titles that describe exactly what is displayed in the table are used. For example, 'A Comparison of …' or 'Demographic Characteristics of the Sample'. Capitalize all major words in the title.
6. The sample size needs to follow the title using standard statistical notation [i.e., Demographic characteristics of the sample (N =200)], unless it is stated within the table. The statistical notation for complete sample size is capital N. (number of cases in subsamples are lower case n).
7. APA (2010, p. 128) format requires the only lines on a table to be the horizontal ones at the top and bottom of the table and at the bottom of the header row (see example). Vertical lines are never used.
8. Header row must repeat when your table crosses pages.

Specific Requirements

1. Abbreviations: All abbreviations used within a table need to be spelled out in full as a note at the end of the table (see examples).
2. Word usage: Use *ILCA*'s preferred word usage listed in *ILCA Style Guidelines for Written Professional Resources* (Appendix A). For example:
    a. Use breastfeeding as one word, not 2 words
    b. Use human milk not breast milk
    c. Use term gender not sex
    d. Use male/female not boys/girls
3. Statistical notations: We are using standard statistical notations according to APA (2010, p. 119-120). Remember that statistical tests are usually italicized (i.e., *p*-value; $\square^2$). Use only these. Some examples are:
    a. Total sample size = N
    b. Sub-sample = n
    c. Mean = *M*
    d. Standard deviation = *SD*
    e. Confidence interval = *% CI* (usually 95% CI)
4. Frequency distribution tables: The number and the percentage for each variable need to be displayed in the table. The table header should have n (%), which is the appropriate statistical abbreviation for this display (see Example #1).
5. Comparisons:
    a. Means: Report *M (SD)*, *t*-tests, tests or one-way ANOVA and *p*-values or confidence interval around the *t* or *F* statistic.

b. Chi-squared: See Example #2

c. Do not need to put total sample size (N = XX) in the title, rather for each group and subgroup (n) within the table (see Example #2).

Example #1: Frequency Distribution Table

Table X.

Employment Characteristics of International Board Certified Lactation Consultants (N=70)

Characteristic	n (%)
Use IBCLC in current job	63 (90.0)
Use IBCLC in volunteer capacity	3 (4.3)
Additional pay for IBCLC credential[a]	6 (8.6)
Place of employment[a, b]	
Hospital	43 (61.4)
Clinic or birthing center	7 (10.0)
Private practice	9 (12.9)
Community or WIC	18 (25.7)
Physician's office	2 (2.9)
Retail sales	1 (1.4)
Research	2 (2.9)
Not currently employed	2 (2.9)
Retired	1 (1.4)

Note. WIC refers to the Supplemental Nutrition Program for Mothers, Infants and Children.

IBCLC is the professional designation for International Board Certified Lactation Consultants.

[a] Missing values = 1

[b] Categories of place of employment are not mutually exclusive

Example 2: Group Comparison Table

Table X.

A Comparison between Parents and Non-Parents Attitudes towards and, Beliefs about Infant Feeding Outcomes (N = 514)

Scales	Total M (SD)	Non-Parents n = 421 M (SD)	Parents n = 93 M (SD)	*t*	*p*
Attitudes towards breastfeeding[a]	27.18 (6.13)	31.12 (7.56)	35.67 (6.67)	5.27	0.00**
Attitudes towards formula feeding[a]	26.31 (5.54)	24.81 (6.95)	24.33 (9.76)	0.17	0.87
Beliefs about outcomes of breastfeeding[b]	105.06 (17.57)	104.33 (16.86)	110.30 (18.03)	3.00	0.00**
Beliefs about outcomes of formula feeding[b]	67.75 (19.82)	68.32 (19.12)	65.41 (22.46)	1.27	0.21

Note. Bonferroni adjustment made at p = 0.0125 (0.05/4). Missing values on parent/non-parent variable = 64.

[a] Attitude scales score ranged from 7- 49 with higher scores indicating more positive attitudes.

[b] Belief scale scores ranges from 19 - 133 with higher scores indicating more positive beliefs.

** $p = < .01$

ANNEXURE H – LETTER FROM LANGUAGE PRACTITIONER

C Woudberg

Language Practitioner

cwoudberg@gmail.com | +27 74 338 7289

To whom this may concern:

I hereby confirm that I have completed the language and technical editing of research assignment titled: **Music elements addressing selected physiological breastfeeding challenges: A systematic review** by MM Kohn. My involvement was restricted to language usage, spelling, completeness and consistency, referencing style and general technical formatting. I did no structural re-writing of the content and did not influence the academic content in any way.

Kind regards,

Christelle Woudberg

ND Language Practice

Member of the South African Translators' Institute

ANNEXURE I – LETTER FORM CO-REVIEWER

Letter of Agreement from Co-Reviewer November 2018

I, Sonja Nel, hereby declare that I agree with the selection of articles included in the systematic review conducted as: *Music elements addressing selected physiological breastfeeding challenges: a systematic review.* The Johns Hopkins research evidence appraisal tool has been used as a form of reviewing articles. This enabled the co-reviewer to determine the quality and level of evidence of all included articles.

My opinion of articles included in the synthesis of this study, was limited to reviewing the quality and level of evidence as indicated by the Johns Hopkins research evidence appraisal tool.

The opinion of the co-reviewer can be seen in appendix B.

SNel

Co-Reviewer

19/11/2018

Date