CHAPTER 1: INTRODUCTION.

1.1 Introduction.

The Lullaby-Centric Approach for Insomnia Mitigation is designed to help those that are suffering with sleeping disorder (Insomnia) with Lullaby and natural sounds (Water drop etc.) to calm their mind and have a quality sleep. As music may be helpful in the treatment of sleep disturbances in healthy populations, including students and elderly. In addition, small studies with clinical populations of traumatized refugees, adults with chronic insomnia and adults with depression insomnia add to the evidence base. However, the impact of music listening in the treatment of depression related insomnia is not well documented. And the system does not require a technical know-how before you can access it. Thus, it makes it a user friendly system.

1.2   Background and Motivation.

Insomnia disorder is defined as difficulties in initiating or maintaining sleep and or non-restorative sleep accompanied by decreased daytime functioning, persisting for at least four weeks. For many patients suffering from depression and anxiety, insomnia is a pervasive problem. Many of the etiological theories of insomnia postulate that heightened emotional reactivity contributes to the maintenance of symptoms. This review focuses on the role of emotional reactivity in insomnia, and how the relationship between insomnia and depression and anxiety may be mediated by emotional reactivity. Furthermore, studies investigating the valence of emotions in insomnia are reviewed. Overall, there is empirical evidence that dysfunctional emotional reactivity might mediate the interaction between cognitive and autonomic hyper arousal, thus contributing to the maintenance of insomnia. Moreover, dysfunctions in sleep–wake regulating neural circuitries seem to be able to reinforce emotional disturbances. It seems plausible that dysfunctional emotional reactivity modulates the relationship between insomnia and depression and anxiety. Considering the interaction between sleep and emotional valence, poor sleep quality seems to correlate with high negative and low positive emotions, both in clinical and subclinical samples. Good sleep seems to be associated with high positive emotions, but not necessarily with low negative emotions. This review underlines the need for future research on emotions in insomnia. (Kira, Marit, Morten, Eus, 2018).

Music is often used as a self-help tool to alleviate insomnia. To evaluate the effect of bedtime music listening as a strategy for improving insomnia, we conducted an assessor-blinded randomized controlled trial. Fifty-seven persons with insomnia disorder were included and randomized to music intervention (n = 19), audiobook control (n = 19) or a waitlist control group (n = 19). The primary outcome measure was the Insomnia Severity Index. In addition, we used polysomnography and autography to evaluate objective measures of sleep, and assessed sleep quality and quality of life. The results showed no clear effect of music on insomnia symptoms as the group × time interaction only approached significance (effect size = 0.71, p = .06), though there was a significant improvement in insomnia severity within the music group. With regard to the secondary outcomes, we found a significant effect of the music intervention on perceived sleep improvement and quality of life, but no changes in the objective measures of sleep. In conclusion, music listening at bedtime appears to have a positive impact on sleep perception and quality of life, but no clear effect on insomnia severity. Music is safe and easy to administer, but further research is needed to assess the effect of music on different insomnia subtypes, and as an adjunctive or preventive intervention. (Kira et al., 2018).

Sleep loss is a widespread problem with serious physical and economic consequences. Music can impact upon physical, psychological and emotional states, which may explain anecdotal reports of its success as an everyday sleep aid. However, there is a lack of systematic data on how widely it is used, why people opt for music as a sleep aid, or what music works; hence the underlying drivers to music-sleep effects remain unclear. We investigated music as a sleep aid within the general public via a mixed methods data online survey (n = 651) that scored musicality, sleep habits, and open text responses on what music helps sleep and why. In total, 62% of respondents stated that they used music to help them sleep. They reported fourteen musical genres comprising 545 artists. Linear modelling found stress, age, and music use as significant predictors of sleep quality (PSQI) scores. Regression tree modelling revealed that younger people with higher musical engagement were significantly more likely to use music to aid sleep. Thematic analysis of the open text responses generated four themes that described why people believe music helps sleep: music offers unique properties that stimulate sleep (Provide), music is part of a normal sleep routine (Habit), music induces a physical or mental state conducive to sleep (State), and music blocks an internal or external stimulus that would otherwise disrupt sleep (Distract). This survey provides new evidence into the relationship between music and sleep in a population that ranged widely in age, musicality, sleep habits and stress levels. In particular, the results highlight the varied pathways of effect between music and sleep. Diversity was observed both in music choices, which reflected idiosyncratic

preferences rather than any consistent musical structure, and in the reasons why music supports good sleep, which went far beyond simple physical/mental relaxation. (Trahan, Durrant, Mu, Williamson, 2018).

1.3   Statement of the problem.

Nowadays, it is highly prevalent in the modern society, with about 30% of the general population experiencing insomnia symptoms and 6%–20% of the population fulfilling the criteria for an actual insomnia disorder. Insomnia is a major health problem associated with reduced quality of life, disturbed mood, cognitive impairments and elevated risk for mental disorders, such as depression and anxiety. Insomnia is the most common sleep disorder, and it is characterized by persistent difficulties initiating or maintaining sleep, including early morning awakening (EMA), accompanied by daytime impairments which makes it a serious problem that needs to be addressed.

1.4   Aim and objectives.

The aim of developing this application is to create a mobile application lullaby-centric approach for the mitigation of insomnia to help improve sleep quality. With the following objectives:

1. To evaluate the impact of lullabies on sleep quality in individuals with insomnia
2. To design a mobile app to use lullaby for insomnia control
3. To implement the mobile app to use for insomnia control
4. To eveluate the usefulness of the app for insomnia control.
5. To design the System JAVA.
6. To test and implement the proposed system

1.5   Significance of the Project.

The implementation of this mobile application helps to address the issue of primary insomnia that is the issue of not having a quality sleep at large. This Lullaby-Centric Approach for Insomnia Mitigation System will serve as an automated system that will be an avenue that uses music interventions and no-music controls for primary insomnia patients so that the system will be available to be accessed by users anywhere and anytime.

This project is significant for the following reasons:

- Music improve sleep quality in adults with primary insomnia
- Lullaby songs induce one to sleep in the first 20 minutes
- It provides users with user friendly interface

1.5.1   Project Risks Assessment

Table 1.0 Risk Assessment

RISKS	SOLUTIONS
Unable to carry out research due to loss of hardware/ software resources	Replace the hardware/software resources
Loss of work due to System crash and failure	Weekly data backup to External drive
Software availability	Software requirements will be identified in good time for possible contentious software.

1.6   Scope

This project is limited to focus on creating a mobile application Lullaby Centric Approach. For the design and implementation, I will make it a web based and it will be deployed on a local host for testing purpose.

1.7   Project Organization.

The project write-up consists of the following chapters:

Chapter One: This chapter covers the project background study, Aims and Objectives of the project, the Statement of Problem, and the Significance of the study.

Chapter Two: It discusses the Literature Review of this project and some related research.

Chapter Three: The methodology used to implement the project, system analysis and design, tools and techniques as well as description of the mechanisms are discussed in this chapter. Details, such as the software architecture, Class Diagrams, Use-case, and Activity Diagram, are captured in this chapter.

Chapter Four: This chapter discusses the development and implementation of the system. It also analyzes user's response as highlighted in chapter 3, displaying screenshots of the interfaces.

Chapter Five: Conclusion of the project processes is stated.

CHAPTER 2: LITERATURE REVIEW.

2.1   INTRODUCTION.

This chapter provides background knowledge based on relevant literature. The chapter reviewed literature that are relevant to the project and identifies the gaps in the related systems that could be addressed by the proposed system. Section 2.2 is based on the Historical Overview of the effect of lullaby songs on the sleep quality. Section 2.3 gives descriptions of some of the literature available with regards to the application of lullaby centric approach in solving the research question. Finally, section 2.4 is a summary of the entire chapter.

2.2   Overview of Insomnia.

Insomnia is a major health problem associated with reduced quality of life, disturbed mood, cognitive impairments and elevated risk for mental disorders, such as depression and anxiety (Riemann et al., 2015). Insomnia is the most common sleep disorder, and it is characterized by persistent difficulties initiating or maintaining sleep, including early morning awakening (EMA), accompanied by daytime impairments (APA, 2013). It is highly prevalent in the modern society, with about 30% of the general population experiencing insomnia symptoms and 6%–20% of the population fulfilling the criteria for an actual insomnia disorder (Ohayon, 2002; Roth et al., 2011).

Standard treatments for insomnia include both pharmacological and psychological treatments. Pharmacotherapy shows good short-term effects, but is associated with negative side-effects and is only recommended for short-term use (Riemann et al., 2015). Cognitive behavioral therapy for insomnia (CBT-I) has strong empirical support and is recommended as first-line treatment for persistent insomnia (Riemann et al., 2017). CBT-I works by using a combination of behavioral and cognitive strategies (e.g. sleep restriction, stimulus control, cognitive therapy and sleep hygiene education) to target factors that perpetuate the insomnia disorder. However, CBT-I requires substantial time and behavioral change from the patients if they are to benefit from the therapy, and not all patients reach this goal (Morin & Benca, 2012; Riemann et al., 2015).

As such, the standard treatments have certain limitations, and studies show that the majority of individuals with insomnia do not seek conventional treatment (Morin, Leblanc, Daley, Gregoire, & Mérette, 2006). Instead, many use complementary health approaches such as herbal or dietary products to promote sleep or initiate self-help strategies such as reading or

listening to music, even though the effects are not well documented. Music is a commonly used tool for sleep improvement (Aritake-Okada, Kaneita, Uchiyama,Mishima,&Ohida,2009;Urponen,Vuori,Hasan,&Partinen,1988), and a Canadian study found that among individuals with insomnia disorder, 43.6% had used music to promote sleep (Morin et al., 2006). Therefore, it is highly relevant to clarify whether music listening can actually improve sleep or not; research indicates that there is a scientific rationale for impact of music on insomnia.

Music is increasingly used in clinical settings including oncology and neurorehabilitation (Bro et al., 2017; Sihvonen et al., 2017), and music psychology and neuroscience research highlight a number of mechanisms that could underlie the putative effect of music on sleep. First, studies show that there is a close link between music and emotion, and music is commonly used for emotional self-regulation (Koelsch, 2010; Saarikallio, 2011). This could be relevant for insomnia, as insomnia is often associated with emotional disturbances including depression and anxiety. The ability of music to induce positive mood states would be expected to facilitate sleep in persons with insomnia. Similarly, music may work as a positive distraction from ruminations or worries (Garza-Villarreal et al., 2014).Worries about sleep can be a perpetuating factor leading to the persistence of the insomnia condition, and distraction from sleep-onset worries would be expected to ease the transition into sleep.

Another important mechanism is the impact of music on arousal. Experimental and clinical studies have shown that music can affect our level of arousal as reflected in measures of autonomous nervous system function (Bernardi et al., 2009; Chanda & Levitin, 2013). For example, studies have shown that listening to slow instrumental music can promote relaxation reflected in reduced cortisol levels during operational procedures (Nilsson, 2009), as well as decreases in heart rate and respiratory rate (Chlan, 1998). This is important in relation to insomnia, as the prevailing "hyperarousal" theory states that insomnia involves increased levels of arousal as reflected in both psychological and neurophysiological measures (Bonnet & Arand, 2010; Riemann et al., 2010). As such, soft music could potentially work as a sleep aid in persons with insomnia by reducing physiological and cognitive arousal. Still, the effect of music for relieving insomnia is not well documented. A number of systematic reviews state that music listening can improve sleep quality in adults   with sleep problems (DeNiet, Tiemens, Lendemeijer, & Hutschemaekers, 2009; Jespersen, Koenig, Jennum, & Vuust, 2015; Wang, Sun,&Zang,2014). In 2016 an additional randomized controlled trial (RCT) was

published reporting a significant effect of music on sleep quality in elderly persons with poor sleep (Wang, Chair, Wong, & Li, 2016).

These previous studies seem to support the use of music as a sleep aid. However, the results are limited by lack of information on the nature of the sleep problems and assessment of sleep parameters. The populations of the previous studies are very diverse and none of these included adults with insomnia disorder. Furthermore, several studies suffer from substantial risk of bias due to no blinding of outcome assessors and other methodological limitations, such as baseline differences and differences between groups in the data collection procedure. Finally, the reported outcomes include mainly the Pittsburgh Sleep Quality Index (PSQI), and no studies assess insomnia symptoms. Only one RCT included polysomnography (PSG) to assess objective sleep changes, and found shortened stage 2 sleep and prolonged rapid eye movement (REM) sleep in the music group compared with controls (Chang, Lai, Chen, Hsieh, & Lee, 2012). However, the effects were rather small, and more studies are needed to assess the impact of music on sleep architecture.

To address these shortcomings, we conducted an assessor blinded RCT to evaluate if bedtime music can alleviate insomnia in adults with insomnia disorder. We hypothesized that the participants listening to music would experience improvement in sleep compared with the active and passive control group. Additionally, we expected the music group to experience improved quality of life.

2.2.1 The Effect of Music on the Sleep Quality

A number of studies conducted in clinical settings have suggested that sedative music may have positive effects on sleep via muscle relaxation and distraction from thoughts (Mornhigweg & Voigner 1995, Zimmermann et al. 1996, Johnson 2003, Lai & Good 2004). Music can reduce sympathetic nervous system activity, decrease anxiety, blood pressure and heart and respiratory rates (Standley 1986, Good et al. 1999, Salamon et al. 2003).

Eight studies have had a direct focus on the effects of music on sleep. Zimmermann et al. (1996) studied the effects of relaxing music on sleep and pain in 96 patients who had undergone coronary artery bypass graft surgery. Levin (1998) examined the effects of 'Brain Music' in the treatment of 58 patients suffering from insomnia. 'Brain Music' is basically the transformation of spontaneous bioelectrical activity into music. Gitangali (1998) examined a traditional Indian ragha, which is similar to lullabies. Two studies have been conducted with children (Field 1999, Tan 2004). In Field's study, children in the experimental group listened

to music at naptime, while in Tan's study they also did so at bedtime. Three researchers have investigated the effects of music on sleep in older adults (Mornhigweg & Voigner 1995, Johnson 2003, Lai & Good 2004). All studies showed that music had a statistically significant sleep-promoting effect, except for that by Gitangali (1998) in which no evidence was found for the positive effect of music on sleep.

These results indicated that music is a potential nonpharmacological intervention for the treatment of sleep disturbances such as insomnia. However, they were based on self-report measures and have further limitations. For example, in most studies a control group was not used, whilst in theirs (Fried 1990a,b, Lai & Good 2004) music was combined with relaxation therapy or some other intervention, making it difficult to draw conclusions about the effects of music per sec.

Sleep, a vital ingredient in life, is an active and complex rhythmic state that may be affected by the aging process. Surveys have estimated that more than 50% of communityliving people age 65 or older experience sleep disturbances (Bliwise et al. 1992, Foley et al. 1995). These changes in sleep

patterns are reflected in the common sleep-related complaints of older adults, such as taking longer to fall asleep, awakening more often, and being sleepy in the daytime. Sleep disorders can result in tiredness, fatigue, depression, greater anxiety, irritability, pain sensitivity, muscle tremors, immunosuppression, and lack of daytime alertness (PandiPerumal et al. 2002). Although there is much research about sleep, few studies have focused on the effects of music in improving sleep quality, particularly in older adults. One method to improve sleep is to take medication. Hypnotics are taken regularly by 15–19% of older adults (Clapin-French 1986, Morgan et al. 1988, Englert & Linden 1998), but can cause daytime residual effects, tolerance, dependence, altered sleep stages and rebound insomnia (Morin & Kwentus 1988, Gillin & Byerley 1990). Their safety and efficacy for sleep problems in older people has not been established (National Institute of Health 1991). Therefore, non-pharmacological methods that promote a mind– body interaction without side-effects should be tested to promote sleep in older people.

Only three investigators have studied the use of music to promote sleep. Each found that music had beneficial effects (Mornhinweg & Voignier 1995, Zimmerman et al. 1996, Levin 1998), but there were methodological problems of mixed age groups, small sample size, lack of randomization, unbalanced groups, and lack of rationale for the choice of music intervention. Further, none considered confounding factors of anxiety and depression, and none studied the effects of music on sleep in older people.

Based on a psychophysiological theory synthesized from the literature, sedative music induces relaxation and distraction responses (Good et al. 2001), which reduce activity in the neuroendocrine and sympathetic nervous systems, resulting in decreased anxiety, heart rate, respiratory rate, blood pressure (Standley 1986, Zimmerman et al. 1988, Good et al. 1999) and sleep (Johnson 1991). Music has been found to reduce circulating noradrenaline (Mockel et al. 1994, Gerra et al. 1998), which is associated with sleep onset (Irwin et al. 1999). Thus, a sedative music intervention was expected to improve sleep quality.

or control group (n ¼ 30). The envelopes were prepared by a different person so that the investigator (first author) was blind to block size and order of assignment.

Because sleep onset has been found to take about 13– 35 minutes in adults (Hayter 1983, Gislason et al. 1993), we decided to use 45 minutes of music as therapy every night at bedtime to guard against music ending earlier than sleep onset. In addition, eight factors were identified in the literature as influencing sleep, and these were controlled in the research design. These were gender, caffeine consumption, meditation, disease, medication, cognitive status, sleep apnoea, and sleep environment (Addison et al. 1986, Rediehs et al. 1990, Ancoli-Israel et al. 1991, Gislason et al. 1993, Kelly et al. 1997, Neubauer 1999). Eight other factors found in the literature were considered as possible covariates: age (Bliwise 1993), anxiety (Morgan et al. 1989), depressive symptoms (Knowles & MacLean 1990), physical activity (Stevenson & Topp 1990), and bedtime routine (Johnson 1986), herbal tea consumption, after-lunch napping (Floyd 1999) and reported pain (McCall 1995).

Participants were visited at home by the investigator at the start of the study to screen for eligibility, collect baseline data, allocate them to the study groups, and teach the experimental group to use the music intervention at bedtime each night. Thereafter, weekly visits for 3 weeks were made to measure sleep quality, collect completed sleep logs, and distribute new ones. Participants were also telephoned twice weekly during the study period to reinforce adherence to the protocol.

2.2.2   Sleep quality outcomes

Singing lullabies has long been a part of many mothers' coping and survival tools particularly used when soothing a distressed baby. A lullaby is a vocal piece of music specifically designed to lull a child to sleep by using a repeated formula. Typically they display musical characteristics of a descending melodic line, portamento effects and stylised representations of sighing and weeping whereby 'The singer, usually a woman, communicates in a direct, intimate manner that can be formalised and at the same time intense' (Grove Dictionary of Music, 2003).

Several studies have examined the effects that lullaby singing has on infants, their sleep patterns and mother–infant bonding. In studies with neonates, music has been found to positively affect selected stress behaviours, weight caloric and formula intake of low birth weight neonates in a newborn intensive care unit (Caine, 1991; Cassidy & Standley, 1995; Coleman et al ., 1997), and the therapeutic effects of music and of mothers' voice on premature infants (Standley & Moore, 1995), with overwhelming positive effects. Similarly, studies with newborns show the value of using lullabies to promote sleep (Unyk
et al ., 1992; Trehub & Trainor, 1998). That said, it is our perception that the daily practice of singing lullabies within the home environment, and in fact music in general, is declining, slowly being replaced by pre-recorded music which may be simpler to apply by a busy modern-day parent.

A mother's preference for using pre-recorded music is reinforced by the explosion of commercial music specifically promoted as being suitable for babies and infants. Productions such as Music for Dreaming, Bedtime with the Beatles, Baby Mozart and Bach for Babies among many others, are big sellers for commercial recording companies (Custodero et al., 2002). These musical choices are said to create a smarter baby as promoted by such movements as The Mozart Effect (Shaw, 2000). The choice of Western classical music appears to bring with it the perception that it is of high art status, intellectual and therefore appropriate for young developing Einsteins (Custodero et al ., 2002).
The very fact that one of these CD productions is titled Baby Einstein's Lullaby Classics affirms this notion. At present, there is no evidence that such music selections are most beneficial. In fact, given that traditional high art music is complex – with complex harmonies, rhythms, changes in dynamics and generally a lack of predictability which is typical of a lullaby form, a baby might not have the prerequisite cognitive skills to deal with such music (Papouˇsek, 1996).

At the same time, infants' capacities for listening to and making meaning from music should not be underestimated either (Papoušek, 1996). Studies have shown they have a preference for predictable, static melodies and harmonies; those typically found in lullabies (Schwartz, 2004). Further, babies have been shown to prefer their mothers' voices above all others (Lecanuet, 1996).

Making music (as opposed to listening to pre-recorded music) is a social event, bringing people together and allowing for the communication of feelings and emotions that may alter subtly within momentary changes within one or more participants (Wigram et al ., 2002). Studies have shown how music including lullabies promotes meaningful mother– infant interaction (Trehub et al ., 1997; Trehub & Trainor, 1998; Bergeson & Trehub, 1999; Milligan et al ., 2003; Oldfield et al ., 2003; Shenfield et al ., 2003). Here, mothers are able to select and sing lullabies to promote intimacy with their babies. Currently there is no evidence to suggest that mothers in Australia do not sing to their infants. A recent survey in the USA, however, did report that two-thirds of the parents reported that they sang and played music with their infants every day (Custodero et al ., 2002).

It is our view that the practice of music-making as a family or social activity beginning in infancy, becomes something only talented people participate in, or those whose parents see learning music as something extra they can offer their children. For many others, engagement in listening to pre-recorded music becomes the extent of their music participation. Babies become children, move through adolescence and then become parents themselves. Without having been exposed to this activity of making music for music's sake, for enjoyment and socialization, this cycle then perpetuates. Further, evidence now suggests that involvement in music making particularly early in life may reduce the effects of medical illnesses such as brain injury, stroke and dementia by hard wiring bilateral neural networks (O'Callaghan, 1999).

The musical qualities contained in lullabies are not only effective in calming babies, singing lullabies also facilitates a relaxation response in mothers and can assist in their ability to cope with the demands of motherhood (Mackinlay & Baker, 2005). This is particularly important for mothers who may be experiencing difficulties with day-today coping resulting in the development of feelings of failure, frustration, tension and guilt. Lullabies therefore serve as an outlet for emotional engagement and expression by the performer, thus serving the dual function of soothing a child while simultaneously releasing the singer's own feelings of desire and discontent (Masuyama, 1989; Macfie, 1990; Manasseh, 1991).

The song texts of lullabies can therefore reflect social and musical themes of interest to mothers. By engaging in the singing of these songs, mothers are in effect singing about their own feelings, and the very act of doing so allows them to release and let go of pent-up emotions. Turry (1999) describes similar effects of improvised songs when working with hospitalised children, arguing that the tension underlying emotional energy is released and dissipated so that emotions such as sadness, fear or anger can be safely acknowledged and explored. She further adds that the act of singing (as opposed to listening) allows the person to express and take ownership of the stated feelings. In this sense, the songs may have provided an appropriate avenue for emotional expression, which may lead to an overall enhancement of positive mood states and a decrease in the negative mood states.

Katsch & Merle-Fishman (1985) and Austin (1998) state that singing songs gives voice to intense pain, fear and anger, and in doing so one begins to experience and express more intense emotion.

In this University of Queens land study, we provided mothers with an education session which informed them of the value in singing lullabies for their babies' well-being, for their relationships with their babies, and for themselves. Within this session, we also offered them training on how to use lullabies effectively. Six weeks later we met with mothers a second time to find out how they had incorporated the lullaby programme within their day-to-day lives. With this in mind, in this paper we first describe how the education session was delivered, and how the singing techniques and their purpose were explained. We then address the following research questions – how did the mothers use the educative material? What lullabies did they sing and why? What was the value of the education for the mothers?

2.2.3   Music and Relaxation

There is ample research documenting the use of music as a means of relaxation. Research posits that participants who listened to music while attempting to relax achieved an increase in relaxation levels (Lai, 2004; Thaut & Davis, 1989, 1993). It has also shown physiological evidence of relaxation through decreases in respiratory rates, heart rates, anxiety reports, blood pressure, and in some instances, behavioral indices of pain or self-reported pain (Davis, 1992; Good et al., 1999; Standley, 1986).

Two studies support music listening as a successful means of increasing relaxation when coupled with instruction in other relaxation techniques (Liebman & MacLaren, 1991; Robb, 2000). Robb (2000) asserts that the use of music with progressive muscle relaxation showed the greatest decrease of anxiety as measured by state trait anxiety inventory scores and visual analog scale scores. Adolescents in their third trimester of pregnancy who received music paired with relaxation techniques showed less anxiety than adolescents who were only given instruction in relaxation techniques (Liebman & MacLaren, 1991).

Evidence suggests that music therapy can be used to assist with relaxation across a wide variety of populations. A pilot program at a nursing home examined the effective use of music alone to relieve stress in nursing home staff (McCarthy, 1992). Self-perceived ratings on all scales completed by psychiatric prisoner-patients showed music therapy interventions were successful in increasing relaxation, affect, and positive thought (Thaut, 1989).

Infants who received music and massage in multimodal stimulation techniques used by parents in a parent neonate parent training study showed less infant stress behaviors and demonstrated behaviors typical of infants with lower stress levels, such as shorter lengths of stay in the neonatal intensive care unit and higher average daily weight gain (Whipple 2000). This positive reception across a myriad of populations suggests that music would be a useful tool with the population of children at a daycare facility. In summary, music has the ability to increase relaxation, across a wide variety of populations, when presented alone, or paired with other relaxation techniques.

2.3   Overview Related Work

In every hospital there exists a very large number of queues usually formed by patients to see a medical specialist, there is no exception for Insomnia patients too, so this will provide an avenue to address the issue. A number of related work exist for the application of Lullaby Centric for Sleep and Insomnia in different institutions.

2.3.1   Lullaby: A Capture & Access System for Understanding the Sleep Environment: The bedroom environment can have a significant impact on the quality of a person's sleep. Experts recommend sleeping in a room that is cool, dark, quiet, and free from disruptors to ensure the best quality sleep. However, it is sometimes difficult for a person to assess which factors in the environment may be causing disrupted sleep. In this paper, we

present the design, implementation, and initial evaluation of a capture and access system, called Lullaby. Lullaby combines temperature, light, and motion sensors, audio and photos, and an off-the-shelf sleep sensor to provide a comprehensive recording of a person's sleep. Lullaby allows users to review graphs and access recordings of factors relating to their sleep quality and environmental conditions to look for trends and potential causes of sleep disruptions. In this paper, we report results of a feasibility study where participants (N=4) used Lullaby in their homes for two weeks. Based on our experiences, we discuss design insights for sleep technologies, capture and access applications, and personal informatics tools. (Matthew Kay, Eun Kyoung Choe, Jesse Shepherd, Benjamin Greenstein, Nathaniel Watson, Sunny Consolvo, Julie A. Kientz, 2012).

2.3.2   Use of sleep hygiene in the treatment of insomnia: Sleep hygiene (SH) refers to a list of behaviors, environmental conditions, and other sleep-related factors that can be adjusted as a stand-alone treatment or component of multimodal treatment for patients with insomnia. This paper presents a review of SH, how this concept has been applied and often modi®ed over the past 24 years, and how it relates to the modern sleep disorder nosology, particularly Inadequate Sleep Hygiene. Although a recognized and commonly utilized treatment option, there is no absolute consensus about which steps must be included to constitute SH treatment, and there is much overlap between SH and other cognitive-behavioral treatments for insomnia such as Stimulus Control Procedures and Sleep Restriction Therapy. The literature on the effects of manipulations of individual components of SH under experimental conditions (e.g. effects of presleep alcohol or caffeine intake) in normal sleepers show mixed results. Empirical data demonstrating the role of poor SH as a contributor to insomnia, or showing that good SH improves sleep in patients with insomnia, is not available. Instead of evaluating the impact of a comprehensive list of SH recommendations, a focus on guidelines for use of individual rules is needed. & 2003 Elsevier Science Ltd. All rights reserved. (Edward J. Stepanski and James K. Wyatt, 2010).

2.3.3   The music that helps people sleep and the reasons they believe it works: A mixed methods analysis of online survey reports: Sleep loss is a widespread problem with serious physical and economic consequences. Music can impact upon physical, psychological and emotional states, which may explain anecdotal reports of its success as an everyday sleep aid. However, there is a lack of systematic data on how widely it is used, why people opt for music as a sleep aid, or what music works; hence the underlying drivers to music-sleep effects remain unclear. We investigated music as a sleep aid within the general public via a mixed

methods data online survey (n = 651) that scored musicality, sleep habits, and open text responses on what music helps sleep and why. In total, 62% of respondents stated that they used music to help them sleep. They reported fourteen musical genres comprising 545 artists. Linear modelling found stress, age, and music use as significant predictors of sleep quality (PSQI) scores. Regression tree modelling revealed that younger people with higher musical engagement were significantly more likely to use music to aid sleep. Thematic analysis of the open text responses generated four themes that described why people believe music helps sleep: music offers unique properties that stimulate sleep (Provide), music is part of a normal sleep routine (Habit), music induces a physical or mental state conducive to sleep (State), and music blocks an internal or external stimulus that would otherwise disrupt sleep (Distract). This survey provides new evidence into the relationship between music and sleep in a population that ranged widely in age, musicality, sleep habits and stress levels. In particular, the results highlight the varied pathways of effect between music and sleep. Diversity was observed both in music choices, which reflected idiosyncratic preferences rather than any consistent musical structure, and in the reasons why music supports good sleep, which went far beyond simple physical/mental relaxation. (Tabitha, Simon, Daniel, Victoria 2018).

2.3.4   The Effect of Music on The Sleep Quality of Breast Cancer Patients: Sleep disorders may result in fatigue, tiredness, depression and problems in daytime functioning. Music can reduce sympathetic nervous system activity, decrease anxiety, blood pressure, heart and respiratory rate and may have positive effects on sleep via muscle relaxation and distraction from thoughts. This paper is aims to investigate the effects of music on sleep quality in treatment provided for patients with breast-cancer with poor sleep. Method: Control groups have not been used in most previous studies. We used a two-group repeated measures design. Sixty 60 patients with breast cancer (aged between 27 and 69 years) with sleep complaints were studied in 2008. Participants listened for between 21.00 and 01.00 at night to soft instrumental music (experimental group) at bedtime for 1 week. The control group received no intervention. The data were collected by using a questionnaire determining the socio demographic features, Pittsburgh Sleep Quality Index (PSQI) were used in order to collect the data and Visual Analog Scales-VAS were utilized to measure level of satisfaction after the procedure. Results: It was found out that music-therapy provided to the music group before sleep affected positively their quality of sleep whereas the quality of sleep of control group worsened more during hospitalization period. Also, the research results demonstrated that although there was a negative correlation between patient satisfaction and their quality of sleep in the music group it was not statistically significant ($p > 0.05$). Conclusion: Relaxing classical

music is an effective intervention in reducing sleeping problems. Nurses could use this safe, cheap and easy to learn method to treat insomnia. (Diğdem Lafçi, Gürsel Öztunç, 2015).

2.4   Comparative Analysis.

Author	Year	Title	Methodology
Matthew Kay, Eun Kyoung Choe, Jesse Shepherd, Benjamin Greenstein, Nathaniel Watson, Sunny Consolvo, Julie A. Kientz,	2012	Lullaby: A Capture & Access System for Understanding the Sleep Environment	A feasibility study where participants (N=4) used Lullaby in their homes for two weeks. Based on our experiences, we discuss design insights for sleep technologies, capture and access applications, and personal informatics tools.
Edward J. Stepanski and James K. Wyatt	2010	Use of sleep hygiene in the treatment of insomnia	Action research methodology, system as designed, implemented and evaluated.
Tabitha, Simon, Daniel, Victoria	2018	The music that helps people sleep and the reasons they believe it works: A mixed methods analysis of online survey reports	We investigated music as a sleep aid within the general public via a mixed methods data online survey (n = 651) that scored musicality, sleep habits, and open text responses on what music helps sleep and why. In total, 62% of respondents stated that they used music to help them sleep.
Diğdem Lafçi, Gürsel Öztunç,	2015	The Effect of Music on The Sleep Quality of Breast Cancer Patients	We used a two-group repeated measures design. Sixty 60 patients with breast cancer (aged between 27 and 69 years) with sleep complaints were studied in 2008.

2.5   Summary.

The literature reviewed elaborate a clear and concise overview of the current system briefing us on how difficult the current system was on the effect of music on sleep and insomnia. Brief overview of the current system and highlighted some of the project related works in correspondence with the proposed system.

Chapter Three focus on describing the requirement analysis and design, follow by the methodology used in developing the application program. It also discusses the development tools used and utilized for the project.