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THE INFLUENCE OF PARTICIPANT-SELECTED VERSUS EXPERIMENTER-CHOSEN MUSIC ON SUBJECTIVE SLEEP QUALITY OF PEOPLE OVER 60 YEARS OF AGE

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THE INFLUENCE OF PARTICIPANT-SELECTED VERSUS EXPERIMENTER-CHOSEN MUSIC ON SUBJECTIVE SLEEP QUALITY OF PEOPLE OVER 60 YEARS OF AGE

By

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ABSTRACT

THE INFLUENCE OF PARTICIPANT-SELECTED VERSUS EXPERIMENTER-CHOSEN MUSIC ON SUBJECTIVE SLEEP QUALITY OF PEOPLE OVER 60 YEARS OF AGE

By

Po-Ju Chen

The purpose of this study was to examine the effect of music exposure on promoting subjective sleep quality in the elderly population. Thirty-one participants over sixty were randomly assigned to the control group and two experimental groups. Participants in experimental groups were asked to listen to a 45-minute selection of music to fall asleep every night for three consecutive weeks. The Pittsburgh Sleep Quality Index (PSQI) was used to measure participants' sleep quality for the pretest and posttest. Data were analyzed using Independent-Samples *t*-tests comparing change scores. The results indicated that older people who received music at bedtime for three consecutive weeks improved their sleep quality significantly more than older people who did not receive any music. However, there was no difference in improvement of sleep quality between those who received their chosen music at bedtime and those who received experimenter-chosen music at bedtime. Either participant-selected or subject-selected music appears to improve global sleep quality; whereas no improvement was found in the control group.

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CHAPTER I

INTRODUCTION

Background and Significance

Sleep disorders are common in elderly populations (Middlekoop, et al, 1996). In a National Institute on Aging evaluation of late-life sleep complaints, more than 80% of 9000 people age 65 and older reported having experienced sleep disturbance (Schneider, 2002). Older adults tend to experience more frequent and longer awakenings, shortening of total sleep time, and less deep sleep (Espie, 1991; Miles & Dement, 1980; Prinz, Vitiello, Raskind, & Thorpy, 1990). Research also indicated that aging goes along with an increase in the length of stage 1 sleep (Reynolds, et al., 1985). In other words, seniors may also experience longer sleep onset latencies (Prinz et al., 1990). However, the most commonly reported insomnia symptom was difficulty maintaining sleep, which is estimated to occur with 30% to 37% of elderly people (Gislason, et al, 1993).

The causes of insomnia are multiple, including physical illness, pain, changes in central nervous system functioning and social, psychological, psychiatric, pharmocological and environmental factors (Bliwise, 1989; Wilson & Nutt, 2007; Zepelin, 1983). In addition, depression is one of the most common causes of insomnia in the geriatric population. Untreated depression is likely to lead to insomnia. On the other hand, unsolved insomnia can result in depression (Ancoli-Israel, 2004). Late-life depression significantly increases the risk for suicide. According to the National Vital Statistics reported in 1997, persons age 65 and older comprise 13% of the U.S population, but 19% of completed suicides (Buysse, 2004.) Insomnia may also cause

daytime sleepiness. According to researchers conducting a sub-study of participants from the Cardiovascular Health Study (CHS), adults over age 65 who experience daytime sleepiness have a greater risk of mortality and cardiovascular events (Ross & Shua-Haim, 2000). Therefore, daytime sleepiness caused by insomnia may increase older citizens' risk of death. The use of medicine is the most common intervention for insomnia. However, dependence and impaired psychomotor and cognitive functioning result when using drugs over a long period of time (Ashton, 1994). Consequently, elders who take these drugs are in danger of car accidents, falls, and hip fractures, often leading to long-term care (Griffin et al, 1989; Ray et al, 1992). In addition to medication, other treatments for insomnia involve improving sleep hygiene, exercise, paradoxical intention therapy, cognitive behavioral therapy, relaxation therapy, and stimulus control therapy (Ringdahl, Pereira, & Delzell, 2004). Finding a suitable way to help the older people with insomnia, is an ongoing issue with those who care for the elderly.

Many studies report that music is able to improve mood and help individuals cope with stress (Watkins, 1997), and music has been shown to decrease anxiety and tension in a variety of populations (Davis & Thaut, 1989). Studies have shown that sedative music promotes relaxation of the body (Steelman, 1990; White, 1992), which in turn reduces the circulation of norepinephrine (Gerra et al., 1998). Norepinephrine is related to sleep onset as well as the amount of time in wakefulness at night (Prinz, Halter, Benedetti, & Raskind, 1979). In other words, when the body is relaxed through music, circulation of norepinephrine, which is associated with sleep onset, is also reduced (Tan, 2004). Therefore, a sleep response can be expected via the responses of relaxation, distraction, and a reduction in norepinephrine (Lai, 2001). Music can reduce muscular energy, heart

and respiratory rates, blood pressure, and alleviate psychological distress (Kartman, 1984), which are also related to sleep quality. Clinicians also reported that the use of tranquilizers and hypnotics could be reduced when listening to music at night (Prinsley, 1986). Thus, there is a possibility that music, as a non-pharmacological approach, could be useful for sleep problems (Hanser, 1990).

Non- pharmacological interventions for sleep are underused by Western health care providers, even though they may be more appropriate to insomnia patients than pharmacotherapy (Morin, Gualier, Barry, & Kowatch, 1992). Non–pharmacological therapies that have been investigated for sleep disorders include progressive relaxation, therapeutic touch, sleep hygiene, chronotherapy, stimulus control instruction, sleep restriction, bright light therapy, biofeedback, and paradoxical intention (Morin, 1993). However, most of these interventions are expensive or time consuming. Therefore, music therapy using recorded music, which is a more cost-effective non- pharmacological therapy, might be useful to the elderly, many of whom have limited financial resources. Music therapy has been viewed as a valuable part of treatment for elderly people (Aldridge, 1994). Although there are many studies that examine the effect of music therapy on sleep, only a few studies have investigated the effects of music therapy on sleep in the older population (Johnson, 2003; Lai, 2001; Lindenmuth, Patel, & Chang, 1992; Mornhinweg & Voignnier, 1995). Furthermore, no study compares the effect of participant-selected and experimenter-chosen music on sleep quality of older people. A study published in February 2005 in the *Journal of Advanced Nursing* found that listening to soft music at bedtime assisted older adults in sleeping better and longer. Since the use of music at bedtime may be a viable, indirect way to promote relaxation and

decrease insomnia for older people, a study examining the effects of music therapy on sleep in older population is worth implementing.

Purpose and Research Questions

With the intent of improving sleep quality of older people, the purpose of this research was to examine the effect of music exposure on promoting subjective sleep quality in the elderly population.

The research questions were as follows:

(1) Is there a difference in sleep quality between older people who receive their chosen music at bedtime each night for three weeks and those who receive experimenter-chosen music at bedtime each night for three weeks?

(2) Is there a difference in sleep quality between older people who receive music at bedtime each night for three weeks and those who do not receive music?

CHAPTER II

LITERATURE REVIEW

The Effect of Music on Sleep Quality

Research has shown that music has positive effects on sleep (Field, 1999; Hernández-Ruiz, 2005; Johnson, 2003; Lai, 2001; Lasswell, 2001; Levin, 1998; Lindenmuth, Patel, & Chang, 1992; Mornhinweg & Voignnier, 1995; Tan, 2004; Zimmerman, Nieveen, Barnason, & Schamdered, 1996). However, some studies show inconclusive results (Iwaki et al, 2003; Lazic & Ogilvie, 2006) or opposing effects of music on sleep (Gitanjali, 1998; Rutter & Waring-Paynter, 1992; Sanchez & Bootzin, 1985). Because of these contradictory results about the effects of music on sleep, for both theoretical and practical uses, replicating a study about whether music has a positive effect on sleep quality is valuable and necessary.

The Effect of Participant-selected Music on Sleep

Three studies examined the effects of participant-selected music from repertoire on sleep (Johnson, 2003; Lai, 2001, Zimmerman, Nieveen, Barnason, & Schamdered, 1996). In Lai's (2001) study, participants were given five types of western music: synthesizer, harp, piano, orchestra, slow jazz and one Chinese orchestra from which to choose. Participants listened to their preferred music during their sleep at night for three consecutive weeks. Sleep quality was measured with the Pittsburgh Sleep Quality Index (PSQI) as a pretest and weekly posttests. Results suggested that older adults who received music at bedtime had better global sleep quality than those who did not. In Johnson's

(2003) study, fifty-two women over the age of 70 were asked to select their own music to listen to during the bedtime. They could change their preference nightly as long as they stayed in the same musical category. The majority of participants selected soothing classical music, whereas the rest of participants preferred to listen to sacred music or new age music. Results indicated that using music at bedtime decreased sleep latency and the number of nighttime awakenings in older women.

Zimmerman et al. (1996) studied the effects of music on postoperative pain and sleep in coronary artery bypass graft (CABG) patients. Participants in the music treatment group were asked to either select from five audio tapes or chose from three video cassettes with soft music. They received their soothing music on the second and third day. Instead of listening to music at bedtime, participants received music either in the afternoon or every evening. Sleep was measured using the Richard-Campbell Sleep Questionnaire. Results indicated that participants in music condition had better sleep scores compared to the control group that did not receive either music or music video.

Thaut and Davis (1993) suggested that music therapists should encourage patients to select music based on their personal preference when attempting to enhance relaxation and reduce anxiety, because this might facilitate better sleep. When participants select the music, they view the music as preferred, and the more choices the researcher gives the subjects, the more likely it is that participants will find their truly preferred music, especially if they had their preferred music in mind. Therapists' limiting choices of music set by therapists may cause a problem. If participants show no preference within the group of designated music selections, they might randomly choose music that is not what they truly prefer. Consequently, this minor confounding variable may decrease the

validity of the study. To avoid this pitfall in my study, participants in the participant-selected music group are allowed to choose or provide their preferred music without any limitations.

Two studies used participant selected music without any limitations set by the researcher (Hernández-Ruiz, 2005; Iwaki et al, 2003). In Hernández-Ruiz's study (2005), fourteen abused women in the experimental group were instructed to listen to participant-selected music combined with progressive muscle relaxation (PMR). One of the participants in the experimental group could not specify his choice, so the researcher suggested selections according to the participant' preferred genre. The modified Pittsburgh Sleep Quality Index (PSQI) was used to assess the effect of music intervention on sleep quality for two days. Levels of fatigue were measured by using Fatigue Scale for four consecutive days, and the State Trait Anxiety Inventory was used as pretests and posttests to measure the anxiety during the therapeutic sessions held by the researcher for two consecutive days. Results showed that music had a positive effect on reducing anxiety and also resulted in improving sleep quality in the experimental group. In Iwaki et al's (2003) study, twenty participants who were accustomed to listening to music at bedtime were monitored by a polysomnograph when they were taking a nap in the laboratory. A series of pieces chosen from each participant's preferred music album were played as they fell asleep. Results showed that sleep latency was shorter for the participants in the experimental group who were sleeping with music than for those who did not listen to any music (the control group). However, this tendency reversed when the participants were told to fall asleep as fast as they can. Participants who tried to sleep quickly with music playing demonstrated increased episodic wakefulness and prolonged

sleep latency compared to the no-music group. The results of this study indicated that listening to preferred music promotes falling asleep for those who are used to listening to music during bedtime. However, this may be only effective after balancing other factors, such as the adjustment of one's mood as it relates to the preferred music, and the skill of listening to music for falling asleep. Within this framework, it is not clear if preferred music promotes falling asleep or interferes with it. This outcome is different from the results of other participant-selected studies discussed earlier (Lai, 2001, Johnson, 2003; Eugenia, 2005). Future research concerning the effects of participants' preferred music on sleep quality seems essential.

The Effect of Researcher-selected Music on Sleep

Six studies were found using researcher-selected music as an intervention for sleep (Field, 1999; Lasswell, 2001; Lazic & Ogilvie, 2006; Lindenmuth, Patel, & Chang, 1992; Mornhinweg & Voignnier, 1995; Tan, 2004). In Lindenmuth et al's (1992) study, twenty participants from a nursing home consisted of ten "healthy" older people and ten older people diagnosed with senile dementia of the Alzheimer type (SDAT) were asked to participate both in the control group and experimental group. A behavioral assessment chart of sleeping behavior, which consists of four categories: patient asleep, patient restless, REM, and started tape, was used by the nurses on the hourly midnight shift from 11p.m. to 5 p.m. Ten cassettes of *Music for "Sound" Health* composed of soft piano, electric piano, and sounds of nature were used in this study. The period of conducting this study was four-weeks. At the first week, the nurses recorded data about original sleeping pattern for control "healthy" elderly without using the music. In the second week, the

nurses were instructed to not only mark a check on the list for every hour but also play the tape whenever they found the subject restless. *Music for "Sound" Health* cassette was also played whenever the patient was asleep. A basic sleeping pattern for SDAT control group was obtained at the third week. At the final week, nurses were instructed to play the music to each SDAT participant whenever he or she was restless. Results indicated that there was a significant relationship between the use of music and the number of hours of productive sleep between control and experimental SDAT patients.

In Mornhinweg and Voignnier's (1995) qualitative study, twenty-five elderly were asked to listen to New Age and Baroque music, which all had tempi of less than 70 beats-per-minute. Participants listened to one type of music for five days, played no music for two days, and played the second for the next five days during their bedtime. Upon awakening, they were asked to write their music and sleep experience in a log. The outcome showed that almost all the participants, twenty-four out of twenty-five people, asserted that their sleep disturbance was somewhat reduced after music intervention at bed time.

In Tan's (2004) study, the music used in the study was a collection of different adagios and Enya with tempi beginning at 78 beats-per-minute and gradually dropping to 48 beats-per-minute. Participants in the experimental group listened to this music on a 45-minute CD at nap time and bedtime every day for three consecutive weeks. PSQI was used to assess sleep quality as pretest and three weekly posttests. Tan found that participants who were given background music at naptime and bedtime daily for three consecutive weeks significantly improved their sleep quality globally.

In Lasswell's (2001) study, women in the experimental group listened to researcher-selected music with a Progressive Muscle Relaxation instruction. A seven-point Likert-type scale was used to measure relaxation levels after the intervention. Two self-reports were used to assess sleep quality and daytime sleepiness. Results indicated that music with PMR instruction not only increased the relaxation, but also promoted sleep quality. However, there was no significant difference on daytime sleepiness between groups. In Field's (1999) study, twenty-four children listened to classical guitar music at their naptime for two days, and no music was given for another two days. Results showed that the time before sleep onset is much shorter when children received music at their naptime.

Lazic and Ogilvie (2006) examined the effect of music and general auditory stimulation on sleep quality of ten female students, who were asked to participate in two serious of four consecutive nights. All the first nights served as an adaptation night, and the following three nights were experimental nights. Participants either listened to music, tones, or neither on the experimental nights. "Delta Sleep System," which was claimed to induce sleep, was used in the music experimental night. The researchers used standard polysomnographic measures, quantitative analysis of the electroencephalogram, as well as subjective ratings of sleep quality (PSQI and Stimulus evaluation questionnaire). According to the objective physiological record, the results indicated that music does not have significantly better effect on improving sleep onset latency, sleep efficiency, wake time after sleep onset, or percent of slow wave sleep than the tones and control conditions (Lazic & Ogilvie, 2006).

The subjects of these studies were children (Field, 1999; Tan, 2004), abused women (Lasswell, 2001), and female students (Lazic & Ogilvie, 2006). There are two studies focusing on the effect of experimenter-chosen music on sleep quality of older people (Lindenmuth, Patel, & Chang, 1992; Mornhinweg & Voignnier, 1995). Besides, sedative music was used as researcher-selected music in most of these studies (Lasswell, 2001; Lindenmuth, Patel, & Chang, 1992; Mornhinweg & Voignnier, 1995; Tan, 2004). According to Gaston's definition, the characteristics of sedative music are no accented beats, no syncopation, non-percussive, and tempo around sixty to eighty (Gaston, 1951, 1968). The music generally is categorized as sedative when it is slow, quiet, melodic, and improvised or loosely structured (Thaut & Davis, 1993). Studies have revealed that slow music decreased cortisol hormone levels, plasma norepinephrine, levels of anxiety, heart rate, and blood pressure (Mockel, et al, 1994; Steelman, 1990; White, 1992). According to the literature reviewed earlier, norepinephrine is related to sleep onset (Irwin, et al., 1999) and the amount of night time wakefulness (Prinz, Halter, Benedetti, & Raskind, 1979). Studies have shown that listening to sedative music may reduce norepinephrine (Gerra et al, 1998; Mockel et al, 1994), which in turn induces a sleep response.

The Effect of Sedative Music

Several studies conducted in clinical settings have suggested that sedative music may promote sleep quality via muscle relaxation and distraction from thoughts (Tan, 2004). However, there are still some studies with inconsistent results (Logan & Roberts 1984; Rohner & Miller, 1980). Rohner & Miller (1980) examined the effects of using music on reducing anxiety in high-anxiety individuals. Participants were randomly assigned to four

music treatment conditions or to the control group. Comparable forms of the Eight State Questionnaire (8SQ) were used as measurement. Results suggested that the main hypothesis that music would decrease anxiety compared to no music was not supported. In Logan and Roberts (1984) study, 25 university students received three different treatment conditions: Stephen Halpern's music, "superlearning" music, and no music during 20-min session. Participants' tension levels were measured on a 10-point anchoring scale. A one-way analysis of variance (ANOVA) was used to compare the effects of relaxation music on the tension level in different treatments. Results indicated that there were no significant differences between the treatment conditions. Because a state of tension or anxiety is related to the quality of sleep, these outcomes, in turn, conflict with the statement that sedative music may have positive effects on sleep. Therefore, an assumption that therapist-chosen sedative music has a positive effect on sleep quality may be questionable.

Besides these six studies (Field, 1999; Lasswell, 2001; Lindenmuth, Patel, & Chang, 1992; Mornhinweg & Voignnier, 1995; Lazic & Ogilvie, 2006; Tan, 2004), Levin used Brain music to promote sleep quality (Levin 1998). "Brain music" is individualized music that transforms spontaneous bioelectrical activity of one's EEG into music before it is recorded. Thus, the music used in the study is neither subject-selected nor experimenter-chosen. Forty-four patients with insomnia in the experimental group listened to their own "Brain Music" before going to sleep. Levin indicated that "Brain music" was found to have significant positive effects on more than 80% of the insomniac patients according to both subjective and objective measures.

Many studies indicated that music has a positive effect on inducing sleep or improving sleep quality (Field, 1999; Hernández-Ruiz, 2005; Iwaki et al, 2003; Johnson, 2003; Lai, 2001; Lasswell, 2001; Lindenmuth, Patel, & Chang, 1992; Mornhinweg & Voignnier, 1995; Tan, 2004; Zimmerman, Nieveen, Barnason, & Schamdered, 1996). However, there is no research comparing the difference between the effect of participant-selected music and experimenter-chosen music on promoting sleep quality. The factors under consideration when participants select the music are quite different from those of researchers when choosing music for clients for use at bedtime. While the experimenters consider the characteristics and the structure of music itself, the participants consider their own feelings and preference, their familiarity, and their past experience with the music (Thaut &Davis, 1993). These different factors raise the question of whether these two types of music might have different effects on sleep quality. Therefore, my study compares a difference between preferred music selected by the participants and music selected by the therapists on the sleep quality. The therapist-chosen music is chosen specifically from the sedative music category.

There is one study comparing the influence of participant-selected and experimenter-chosen music on affect, anxiety, and relaxation (Thaut & Davis, 1993). Fifty-four participants were randomly assigned to either the control or one of two experimental groups. Results showed that subjects in all three groups achieved significant relaxation responses. Therefore, both participant-selected and experimenter-chosen music were effective in relieving tension in the study, as was the control. According to the study, rock and popular music, which are both types of excitative music, were selected most often by participants, whereas the experimenter chose sedative music as a music intervention.

Although the participant-selected and experimenter-chosen music were different, there was no difference in the decreased anxiety levels between participants who selected their own music and those who listened to music that was selected by the researcher in this study. Therefore, it is unclear whether preferred music chosen by participants or sedative music selected by experimenter has more effect on promoting relaxation. There may be no real difference between the effect of listening to participant-selected music and the effect of listening to experimenter-chosen music on affect, anxiety, and relaxation. Because promoting relaxation is associated with sleep quality, examining the difference between participant-selected music and experimenter-chosen music on sleep quality may be helpful to clarify this issue.

The Effect of Music on Sleep Quality of Older People

Four studies were found examining the effects of music on sleep in the elderly population (Johnson, 2003; Lai, 2001; Lindenmuth, Patel, & Chang, 1992; Mornhinweg & Voignnier, 1995). In Lindenmuth et al's study (1992), only number of hours asleep was measured. The results revealed a significant relationship between the use of music and the number of hours of productive sleep between control and experimental SDAT patients, while no significant relationship was found between control and experimental "healthy" elderly. In Mornhinweg & Voignnier's (1995) study, the authors used a qualitative approach to examine the effects of intervention on one quasi-experimental group. As a result, twenty-four participants out of twenty-five participants asserted that their sleep disturbances were somewhat reduced because of the use of music. However, only sleep disturbance was assessed, and there was no control group. Other elements of

sleep quality, such as sleep onset latency, presence of pain, and daytime dysfunction, etc, were not assessed in these two studies. The results of these two studies give other researchers preliminary information about the effect of music on sleep of older people. Lai (2001) and Johnson (2003) set inclusion criteria and exclusion criteria for screening their samples. In addition, two kinds of self-reported measurement were used in both studies. In Lai's study, PSQI and a sleep log measured the sleep quality, whereas Stanford Sleepiness Scale (SSS) (Hoddes, Dement, & Zarcone, 1972) and a sleep log were used in Johnson's study. According to Herscovitch and Broughton (1981), SSS is sensitive to deficits in alertness after short-term cumulative partial sleep deprivation (PSD). However, it generally does not predict individual performance efficiency, so it cannot act as a substitute for performance measures in studies involving chronic sleep loss (Herscovitch, & Broughton, 1981). Since the sample of my study may include participants who suffer chronic insomnia, the use of SSS to assess their sleep might threaten the validity of the study. Therefore, my study is used PSQI as a measurement tool. In Johnson's study, data were collected for music intervention for ten nights after assessing condition with no music for ten nights. The intervention time is quite short in Johnson's study compared to Lai's study, which had three weeks of music intervention. Researchers recommend that three weeks is a suitable period of time for observing sleep quality (Roehrs, Zorick, & Roth, 1994; Walsh, et al., 1994) and any new intervention's impact (Hoch & Reynolds, 1986; Wang, 1997) on promoting sleep. Therefore, three weeks is the time period for music intervention in my study, and PSQI is administrated as a pre and post test. Among these four studies, participant-selected music was used in two studies (Johnson, 2003; Lai, 2001), while experimenter-chosen music was used in the

other two studies (Lindenmuth, Patel, & Chang, 1992; Mornhinweg & Voignnier, 1995). There is no study comparing the difference between the effect of participant-selected music and experimenter-chosen music on promoting sleep quality of older people. A study examining the difference between participant-selected music and experimenter-chosen music on sleep quality of older people is worth implementing.

CHAPTER III

METHOD

Design

This quantitative study is a pretest-posttest design. The independent variable consisted of three levels: participant-selected music listening, experimenter-chosen music listening, and no music listening. The dependent variable is sleep quality measured by the Pittsburgh Sleep Quality Index (PSQI) (Buysse, Reynolds III, Monk, Berman, & Kupfer, 1989).

Participants

Thirty-three senior citizens living in the retirement centers and their homes in Michigan began to participate in this study, but two participants became ill and dropped from the study, resulting in thirty-one participants. The average age of these thirty-one participants (19 women and 12 men) is 74 (range: 60 ~ 99). All participants were alert, oriented, and capable of reading, speaking, and communicating with others verbally. All participants confirmed the ability to hear radio or music easily without a hearing aid. They were able to understand, to follow directions, and to manage the CD player.

Materials

Before the intervention, participants in the participant-selected group were asked to report the music they thought might help them sleep better. After getting the information, either the investigator found the music for them or the participants provided the music

themselves (Table 1). Experimenter-chosen music was selected according to whether it corresponded to the characteristics and structure of sedative music, which can be described as slow, quiet, with no accented beats and syncopation (Gaston, 1951; Thaut & Davis, 1993). Sedative music from ten albums that are specifically marketed as the music for better sleep and relaxation was used (Table 2). The length of the tape was determined based on the results of the following studies. The duration of sleep latency in older people is about 13 to 35 minutes (Gislason, et al., 1993, Hayter, 1983). Tension was decreased after listening to sedative music for 25 to 30 minutes (Uplike, 1990; White, 1992). However, Lai (2001) suggested use of a 45- minute cassette recording of music compositions to guard against music ending earlier than sleep onset. Therefore, the researcher used a CD that is approximately 45 minutes for this study. Four participants who did not have a CD player or any required hi-fi equipments in their room were provided such equipment by the researcher.

TABLE 1.

Participant-selected Music

Subject	Selection
C1	Slow classical music (Telemann: Triple Concerto Largo for Strings)
C2	Debussy: Clair De Lune
C3	Golden Oldies
C4	Golden Oldies
C5	Soothing Classical music
C6	Soothing Classical music
C7	Buddhism Prayer Song Classical Relaxation Heal of the Hand
C8	New Age
C9	Classical music
C10	Instrumental music with natural sound
C11	Soft music with ocean sound

TABLE 2

Experimenter-chosen Music

Selection	Album	Artist
Meditation#7-Bedtime Lullaby	Songs of Serenity, Relax Unwind and Meditate	Robbie Cooper
Delta Waves	Sleep Cycle	Brannan Lane
Concerto for Violin and Strings in F minor, Op.8, No.4, R.297 "L'inverno" - 2. Largo	Various: Baroque for Beauty Sleep - Sweet Dreams for Beautiful Dreamers	Maria Graf
Underwater	Sleep Mom, Dad & Baby	Music For Sleep & Relaxation
Good Night~Sleep Tight	One Heart: Healing Native and Classical Flute Melodies for Stress Reduction, Relaxation, Meditation	Maria Kostelas
Marche Funebre, Lento Excerpt	Classical Music For Sleep	Dr. Jeffrey Thompson
Adagio for Sleep	Liquid Mind VIII: Sleep	Liquid Mind
Brahms' Lullaby	Sleep Soundly	Steven Halpern
Meditations for Dreams, Relaxation, and Sleep	The Velocity Of Love	Suzanne Ciani
Sleep, Little Sarah	Lullabies and Butterflies	Gordon Gibson

Procedure

This study had a pretest and a posttest with one control group and two experimental groups. Thirty-three participants were randomly assigned to each group (two participants dropped out of the study). The investigator instructed both treatment groups to ensure a standard procedure for music therapy treatment. The investigator came to a participant's

residence to implement the standard protocol at the first treatment session. The instructions for using music to fall asleep were as follows: First, participants were asked to lie in bed as usual in their residence with a comfortable room temperature, wearing comfortable pajamas or their customary bedclothes. Whether the light was turned off or left on dim depended on the participant's custom. Second, the investigator played the CD with participant-selected or experimenter-chosen pieces at a comfortable loudness level. Participants could choose whether to use earphones. Third, participants were asked to close their eyes and lie in a comfortable position. Lastly, the investigator asked participants to open their eyes and told them to listen to 45-minute selection music to fall asleep every night within these three weeks. They were told to just let the music continue if they fell asleep. If participants did not fall asleep within 45 minutes, they could replay the music again. Participants in the treatment groups were asked to do so for three consecutive weeks. Since participants in the control group were told to observe their sleep patterns for three weeks, the investigator did not give the standardized instruction to them. After three weeks, participants in the control group received a sedative music CD, which was designed to be helpful to their sleep quality. All participants were told this before the pretest to avoid John Henry Effect.[1] During the three-week intervention, the researcher checked each participant's situation and progress by phone weekly. All participants were asked to fill out the PSQI before and after the three-week period.

[1] A tendency for members of the control group in certain experiments to adopt a competitive attitude towards the experimental group, thereby negating their status as controls. (A Dictionary of Psychology, 2001)

Measurement

The Pittsburgh Sleep Quality Index (PSQI) (Buysse, Reynolds III, Monk, Berman, & Kupfer, 1989) was used to measure participants' sleep quality for the pretest and posttest. PSQI is an effective instrument for measuring the quality and patterns of sleep in older adults (Smyth, 2003). According to Buysse et al (1989), PSQI provides a valid and standardized measure of sleep quality and offers an index that is easy for participants to use and researchers to interpret. PSQI is composed of seven components of sleep quality: perceived sleep quality, sleep latency, sleep duration, sleep disturbance, use of medication, daytime dysfunction. Scoring of answers was mostly based on a four-point (0-3) scale. The score range for PSQI is from 0 to 21.The higher the score, the more negative it shows on the Likert Scale, and the worse the quality of sleep. According to Buysse et al, a global score of five points or above indicates that the client has poor sleep quality.

The PSQI can be used for both an initial assessment and ongoing comparative measurements with older adults across all health care settings (Smyth, 2003). Its reliability coefficient for all seven components is .83 (Cronbach's alpha), which indicates that PSQI has a high degree of internal consistency. A significant relationship between the global score and scores from each of the seven components has been established. The original version of PSQI is a self-report questionnaire that indicates any sleep disturbances over the last month. To fit the purpose of this study, a modified version of PSQI was used changing the instructions to "over the past three weeks"

The definitions of the components of sleep quality in this study are as follows: (1) Sleep latency is defined as the time from when the person first tries to fall sleep to the

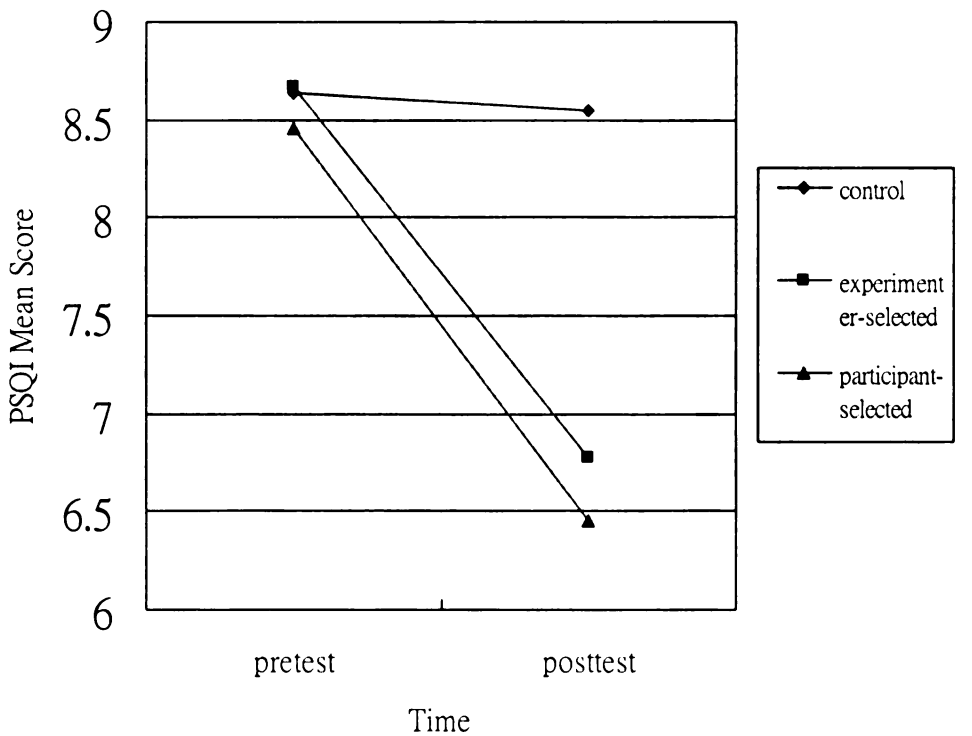
actual onset of sleep, and it shows number of minutes needed to fall asleep and number of times during the previous three weeks the person had difficulty falling asleep. (2) Sleep duration is defined as actual time a person is sleeping, and it shows number of sleep hours per night. (3) Perceived sleep quality is defined as the perception a person holds about his or her sleep, and it is measured by asking a person to rate his or her sleep quality over the last three weeks on a 4-point scale. (4) Sleep efficiency is defined as the ratio of total sleeping time to total nocturnal time in bed. It is measured by number of hours in sleep divided by the number of hours a person spends in bed, and then multiplied by 100 to be expressed as a percentage. (5) Sleep disturbance is defined as when a person has difficulty falling asleep and awaking earlier or later than desired. It is measured by adding the sum of the nine different ways of awakenings on a 4-point scale (6) Use of sleep medication is defined as the use of pharmacological help for sleep. It is measured by asking a person about how often he or she has taken medicine to help sleep and asking to rate the frequency of using sleep medicine on a 4-point scale. (7) Daytime dysfunction is defined as a person who does not feel well rested during the day. It is measured by adding the score of the frequency the person stays awake to the score on how much of a problem it is to keep enthusiasm during the daytime (Buysse et al., 1989; Lai, 2001; Tan, 2004).

CHAPTER IV

RESULTS

Subjective sleep quality was the dependent variable of this study and was measured using the PSQI. Data were entered into SPSS-WINDOWS software version 15.0. Global PSQI mean scores at the pretest and posttest between the control and two experimental groups are shown in the Figure 1. To assure equality of the three groups, the pretest scores of the PSQI were examined by using One-Way ANOVA. The result showed that there were no differences among the pretests of these three groups, $F(2, 28) = 0.007$, $p = 0.993$. In other words, at the beginning of the study the three comparison groups were essentially equal.

Figure1. Global PSQI mean score between groups



The first research question sought to determine if there was a difference in sleep quality between older people who received their chosen music at bedtime and those who received experimenter-chosen music at bedtime each night for three weeks. The global PSQI mean scores and standard deviations for participant-selected music and experimenter-selected music group are shown in Table 3 and Table 4. The higher the score, the poorer the sleep quality is. Both participant-selected and experimenter-selected group had high mean pretest scores (over 5), which indicates poor sleep quality overall. However, the mean score in both groups at posttest are lower. The global PSQI change score was calculated by subtracting the pretest from the posttest. An independent-Samples *t*-test with these change score revealed that there was no significant difference between the two experimental groups, $t(18)=-0.088$, $p=0.931$. In other words, there was no difference in improvement of sleep quality between older people who received their chosen music at bedtime for three weeks and those who received experimenter-chosen music at bedtime. At that point, the two experimental music groups were collapsed into one music condition for later comparisons with the non-music control group.

TABLE 3
Mean and Standard Deviations for Global PSQI Scores in Experimental Groups

Group		Mean	N	Std. Deviation	Std. Error Mean
Experimenter-selected	pretest	8.6667	9	4.50000	1.50000
	posttest	6.7778	9	4.68449	1.56150
Participant-selected	pretest	8.4545	11	4.32120	1.30289
	posttest	6.4545	11	3.53167	1.06484

TABLE 4

Mean Change scores for Global PSQI Scores in Experimental Groups

	group	N	Mean	Std. Deviation	Std. Error Mean
change	Experimenter-selected	9	-2.1111	2.26078	.75359
	Participant-selected	11	-2.0000	3.16228	.95346

The second research question of this study addressed a comparison of the effect of the music on sleep quality of older people between those who received music at bedtime each night for three weeks and those who did not receive music. The global PSQI mean scores and standard deviations for music and non-music groups are shown in Table 5. An Independent-Samples t-test was used with the change scores. According to Levene's Test for equality of variances, equal variances could not be assumed, so a statistical correction was made to account for the fact that the variances could not be assumed to be equal. The result indicated that there was a statistically significant difference between the music and non-music groups, $t(28.254)=2.753$, $p=0.01$. Older people who received music at bedtime for three consecutive weeks improved their sleep quality significantly more than older people who did not receive any music. As for the seven sleep quality components, Independent-Samples *t*-tests with change scores were calculated. According to Levene's Test for equality of variances, equal variances could not assumed for the change scores of perceived sleep quality, sleep latency, sleep disturbance, and daytime dysfunction. Again, a statistical correction was made. The results showed that only sleep disturbance and daytime dysfunction attained a significant difference. These are displayed in Table 6.

TABLE 5

Mean and Standard Deviations for Global PSQI Scores in Music and Non-music Groups

		N	Mean	Std. Deviation	Std. Error Mean
pretest	Non-music	11	8.6364	4.43334	1.33670
	music	20	8.5500	4.28553	.95827
posttest	Non-music	11	8.5455	4.15605	1.25310
	music	20	6.6000	3.97889	.88971

TABLE 6

Sleep quality components (change scores) in Music and Non-music Groups

	t	df	Sig. (2-tailed)	Mean Difference
Perceived sleep quality	-1.128	28.917	0.269	-0.25
Sleep latency	-0.755	26.085	0.457	-0.15909
Sleep duration	1.296	29	0.205	0.231818
Sleep efficiency	-0.890	29	0.381	-0.25909
Sleep disturbance	-3.099	28.491	0.004	-0.44091
Use of sleep medication	-1.688	29	0.102	-0.29091
Daytime dysfunction	-2.599	28.889	0.015	-0.69091

In summary, an Independent-Samples *t*-test with change scores in both experimental groups indicated that there was no significant difference between participant-selected and experimenter-selected groups. An Independent-Samples *t*-test was also used with the change scores in music and non-music groups. The result indicated that there was a significant difference between the music and non-music groups. Moreover, among the seven sleep quality components, only sleep disturbance and daytime dysfunction showed a statistically significant difference between the music and non-music groups.

CHAPTER V

DISCCUSSION AND CONCLUSIONS

The purpose of this study was to examine the effect of music on sleep quality of people over sixty. A difference between music and nonmusic groups was found using the PSQI. , which means that people who received music at bedtime for three consecutive weeks improved global sleep quality compared to people who did not receive music. This outcome is consistent with previous research (Lai, 2001, Eugenia, 2005, Lasswell, 2001; Tan, 2004; Zimmerman, Nieveen, Barnason, & Schamdered, 1996), which all showed that music has a positive effect on enhancing sleep quality. This finding also corresponds to previous studies with older people (Johnson, 2003; Lai, 2001; Mornhinweg & Voignnier, 1995), which suggests that older people receiving music have better sleep. Music also resulted in significantly less sleep disturbance and less daytime dysfunction, as indicated by PSQI scores. Even though Lai's research (2001) indicated significantly better perceived sleep quality, sleep latency, sleep efficiency, and daytime function, but not less sleep disturbance, future research is encouraged to continue exploring the components of sleep quality and their relationship to music-assisted sleep.

Concerning the research question whether there is a difference in sleep quality of older people between those who receive their preferred music at bedtime and those who receive experimenter-chosen music, although the sedative music chosen by the experimenter from the albums is especially marketed for sleep and relaxation, the current study found that there is no difference in sleep quality between the use of therapist-selected and participant-selected music. It should be noted that the music marketed for

sleep and relaxation was no more effective than music that was chosen by the participants according to their preferences. This finding is similar to that of Thaut and Davis's study (1993) in which both subject-selected music and experimenter-chosen music induced significant relaxation. In this case, commercial music produced to induce relaxation was no more effective than music selected by the participants as preferred music.

It is worthy to mention that all participants in the participant-selected group preferred slow, quiet, melodic music which were also qualities of the sedative music chosen by the experimenter. Two participants in the experimenter-chosen group addressed their discomfort about the properties of the music after intervention, while none of the participants in participant-selected group complained about it. And while the two music groups did not differ in outcome, this lends support to the idea that it may be that it is the properties of the music that is the primary factor for better sleep.

Suggestions

As Figure 1. shows(on page 23), it illustrates an increasing distance between the music groups and the no music control, suggesting the possibility that a period of time longer than three weeks may yield a better improvement in sleep patterns. Although researchers report consistency between subjective and objective estimates of sleep (Morin et al. 1993; Kramer et al. 1999), there is one study that does not support this claim. In Lazic and Ogilvie (2006), participants tended to think that the music helped them fall asleep faster, but the opposite tendency was observed from the polysomnography measures. Three studies using polysomnography measures did not find significant effects of music on improving sleep quality (Gitanjali, 1998; Sanchez & Bootzin, 1985; Lazic &

Ogilvie, 2006). Therefore, it is recommended that physiological measurement, such as polysomnography, wrist-acti-graph, and non-invasive thermistor, should be combined with psychological tests in the improvement of sleep quality.

As mentioned before, all older people in the participant-selected group preferred slow, quiet, melodic music which were also qualities of the sedative music chosen by the experimenter. This lends support to the idea that it may be the properties of the music that is the primary factor for better sleep. However, the population of this study is older people over sixty. This notion may not generalize to other age groups. Future research is recommended to examine the difference between participant-selected and researcher-selected music on sleep quality of different age groups.

In summary, receiving music at bedtime for three consecutive weeks for people over sixty significantly improved global sleep quality. Moreover, there was no difference between the sleep quality of those who received experimenter-selected music and those who received participant-selected music. Both participant-selected and subject-selected music appeared to improve global sleep quality, while no improvement was found without the music.

With the above in mind the effectiveness of sedative music used to improve sleep quality would suggest that nursing homes and extended care facilities would be wise to use music to improve their residents' quality of sleep. Likewise, music therapists and nurses are encouraged to use this cost-effective, non-pharmacological intervention to help older people living either in nursing homes or their own homes improve their sleep quality.

APPENDICES

APPENDIX A

INITIAL IRB APPLICATION APPROVAL

MICHIGAN STATE
UNIVERSITY

Initial IRB Application Approval

February 1, 2008

To: Frederick TIMS
School of Music
201 Music Practice Building

Re: **IRB# 07-1064** Category: EXPEDITED 7
Approval Date: February 1, 2008
Expiration Date: January 31, 2009

Title: The Influence of Participant-Selected versus Experimenter-Chosen Music on Sleep Quality of People over 60 Years of Age

The Institutional Review Board has completed their review of your project. I am pleased to advise you that **your project has been approved.**

The committee has found that your research project is appropriate in design, protects the rights and welfare of human subjects, and meets the requirements of MSU's Federal Wide Assurance and the Federal Guidelines (45 CFR 46 and 21 CFR Part 50). The protection of human subjects in research is a partnership between the IRB and the investigators. We look forward to working with you as we both fulfill our responsibilities

Renewals: IRB approval is valid until the expiration date listed above. If you are continuing your project, you must submit an ***Application for Renewal*** application at least one month before expiration. If the project is completed, please submit an ***Application for Permanent Closure***.

Revisions: The IRB must review any changes in the project, prior to initiation of the change. Please submit an ***Application for Revision*** to have your changes reviewed. If changes are made at the time of renewal, please include an ***Application for Revision*** with the renewal application.

Problems: If issues should arise during the conduct of the research, such as unanticipated problems, adverse events, or any problem that may increase the risk to the human subjects, notify the IRB office promptly. Forms are available to report these issues.

Please use the IRB number listed above on any forms submitted which relate to this project, or on any correspondence with the IRB office.

Good luck in your research. If we can be of further assistance, please contact us at 517-355-2180 or via email at IRB@msu.edu. Thank you for your cooperation.

Sincerely,

Peter Vasilenko, Ph.D.
SIRB Chair

c: Po-Ju Chen
4912 S. Hagadorn Rd, Apt No.35
East Lansing, MI 48823

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IRB@msu.edu

APPENDIX B

CONSENT FORM

CONSENT FORM

Project Title: The Influence of Participant-Selected versus Experimenter-Chosen Music on Sleep Quality of People over 60 Years of Age.

You are being asked to participate in a research project called "The Influence of Participant-Selected versus Experimenter-Chosen Music on Sleep Quality of People over 60 Years of Age" to examine the effect of music exposure on promoting sleep quality over a three-week period with people who are between 60 and 85 years old. You will either receive your selected music or music selected by the research to listen to at bed time, or have no music to fall asleep to.

Your participation is voluntary. As a participant, you will be asked to listen to a 45 minute selection of music at bed time, unless you are in the group who receives no music. You will be asked to do so for three consecutive weeks. During these three weeks, you will also have one session with the music therapist. You will be asked to fill out a standard questionnaire on your quality of sleep at the beginning and end of this three week period. There are no known serious risks associated with participation in this study. If at any point you feel tired or uncomfortable during your bedtime because of the music, you can stop participating at any time.

Your results will be kept confidential to the maximum extent allowed by the law. To protect against a breach of confidentiality, your responses will be identified by number rather than name and no names will be used in any report of the research findings. Your responses will be entered in a spreadsheet, and the originals will be shredded upon the completion of the research. All results will be

This consent form was approved by the Social Science/Behavioral/Education Institutional Review Board (SIRB) at Michigan State University. Approved 2/1/08– valid through 1/31/09.
This version supersedes all previous versions. IRB # 07-1064.

treated in strict confidence and you will remain anonymous in any report of research findings. You are offered a CD as a token of appreciation you're your participation. If you stop participating at any time during the intervention, you will still get the music CD. If you wish, information about the findings will be made available to you.

If you have any questions or concerns about this research project, please feel free to contact the investigators at the following location:

Frederick Tims, Ph.D., MT-BC.
College of Music , Michigan State University
East Lansing, MI 48824-1043, U.S.A.
Phone: (517) 353-9856, Email: tims@msu.edu

Po-Ju Chen., MT-BC.
Phone: (517) 305-6936, Email: chenpoj1@msu.edu

If you have questions or concerns regarding your rights as a study participant, or are dissatisfied at any time with any aspect of this study, you may contact anonymously, if you wish :

Peter Vasilenko, Ph.D.
Director of Michigan State University's Human Research Protection Program
202 Olds Hall, East Lansing, MI 48824, U.S.A.
Phone: (517) 355-2180, Fax: (517) 432-4503, E-mail:irb@msu.edu

_____

Signature

Date:_____

Thank you for your participation. Your signature below indicates your voluntary agreement to participate in this study.

This consent form was approved by the Social Science/Behavioral/Education Institutional Review Board (SIRB) at Michigan State University. Approved 2/1/08– valid through 1/31/09.
This version supersedes all previous versions. IRB # 07-1064.

APPENDIX C

RECRUITMENT LETTER

MICHIGAN STATE
UNIVERSITY

Dear Residents,

Hello! My name is Po-Ju Chen. I am a music therapy student at Michigan State University. I also work part time as a music therapist in Burcham Hills Retirement Community. I am conducting a research about examining the effect of music on sleep quality of older adults. Your participation may contribute to the understanding of the benefits of music therapy on sleep quality of seniors. Your participation is voluntary. As a participant, you will be asked to listen to a 15 to 45 minute selection of music at bed time, unless you are in the group who receives no music. You will be asked to do so for three consecutive weeks. You will be asked to fill out a questionnaire on your quality of sleep at the beginning and end of this three week period. There are no known serious risks associated with participation in this study. Your results will be kept confidential to the maximum extent allowed by the law. You are offered a CD as appreciation for participating in this research. If you are interested in knowing more or participating in this study, please join us in an information session or contact me directly at (517) 305-6936

The information session will be held on:

What: **The effect of music on sleep of the elderly**

When: **Wednesday, February 6, 2008, from 3:00 – 4:00 pm**

Place: **Burcham Hills ~ Ada Whitehouse Room**

We will have some music and refreshments during this informational session.

Thank you very much!

Po-Ju Chen., MT-BC.

COLLEGE OF MUSIC

Music Therapy Area

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